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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Whiton's Improved Gear Cutting Machine.

The machine shown in the accompanying engraving represents a new gear-cutter, made from new patterns, by D. E. Whiton, New London, Conn. It is composed of a very strong substantial bed of cast iron mounted upon very firm legs, as shown. This bed is cast in one piece, which, together with the legs, is very strongly braced, thus securing great rigidity. The head for carrying the cutter spindle has a combination of vertical, angular and circular movements, so that the head can readily be adjusted to cut spur, bevel or worm gears. The cutter spindle has a lateral adjustment of half an inch either side of the center. This spindle is 1⅛″ in diameter, runs in compensating bearings and is strongly geared, as shown. ¶ Two pulleys of different diameters accompany each machine, permitting one change of speed. The cutter is fed through the blank by a hand lever attached to a shaft with pinion meshing into a rack, as shown. This lever operates in connection with a ratchet wheel and pawl, so that the lever may be operated in any position that may be found the most convenient.

The inclined or angular position of the cutter head may be accurately adjusted in all positions between a horizontal and a perpendicular, the fine adjustments being made by aid of the graduations upon the arc.

When satisfactorily adjusted, the head may be strongly secured by heavy collar screws. The head also has an adjustment of 15° either side of a vertical line passing through the center, for convenience in cutting worm wheels. The entire cutter head may be adjusted to any desired vertical position by means of a screw, which also acts as a depth gauge, which is very convenient in cutting the teeth of bevel gears to a uniform depth.

The main spindle for holding blanks to be cut is hollow, with a nut at its lower end, by which the necessary friction to hold the spindle may be regulated. The dividing mechanism is attached to the lower end of the main spindle, and is protected by being placed within the bed, as shown. The position of this mechanism is adjusted by a horizontal screw, with a handle at the end of the bed, within easy reach of the operator.

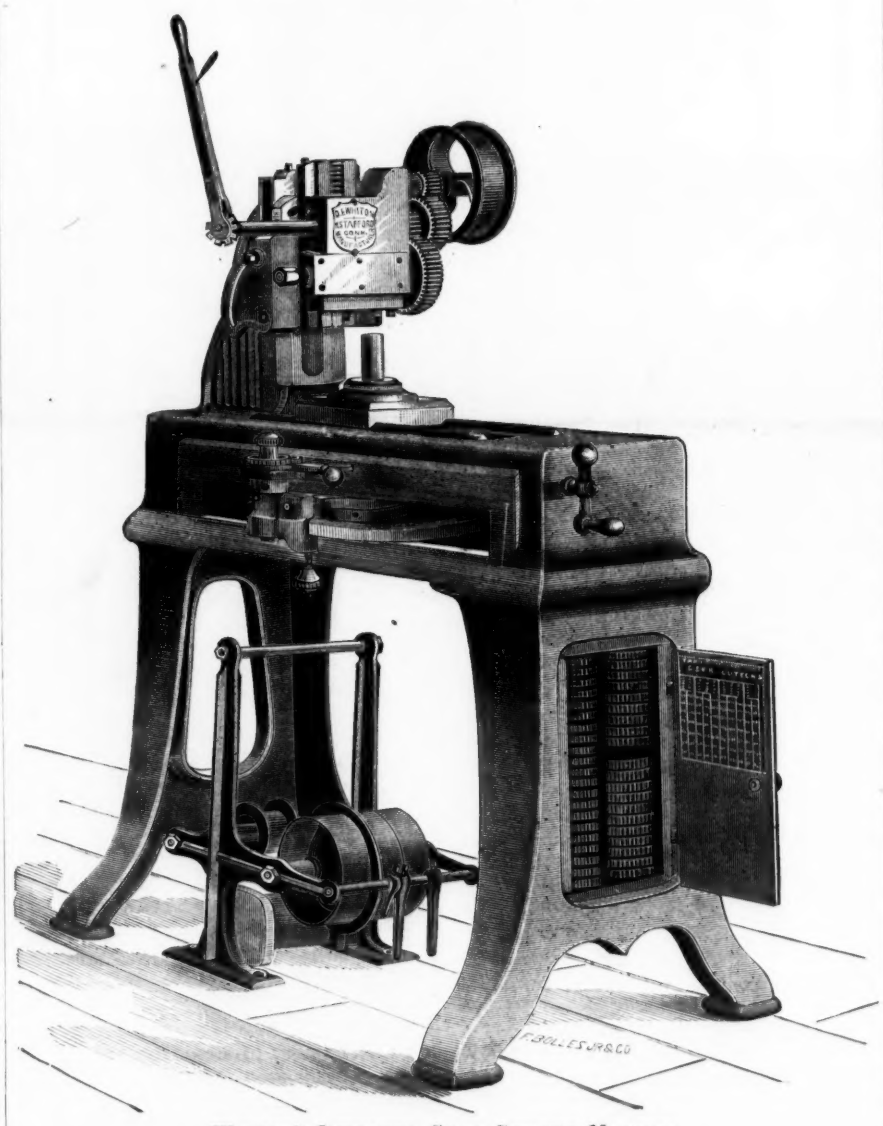
After the desired depth of cut has been ascertained, this spindle may be rigidly held in such position by a nut for that purpose.

For cutting gears of large diameter an adjustable rim support is furnished with each machine.

The capacity of this machine is to cut gears up to 32″ in diameter with a face 8″ wide. ¶ The dividing mechanism consists of a large wheel and pinion, both of which are accurately cut. The distance between the spindle and the pinion can be varied so as to take up all back lash should any ever occur. The proportions of the large gear and pinion are to each other as 6 is to 1. A set of 42 ratchet wheels, 3½″ diameter, accompany the machine and are kept in the closet, as shown. These gears contain teeth numbering from 47 to 97 teeth, which enables the machine to cut gears with every number of teeth to 100, and every even number up to 186. Above this almost any desired number of teeth required in general practice can readily be cut.

The dividing mechanism is operated by a pawl catch which swings against a stop. A guard is used in connection with the pawl to be so adjusted that the skipping of any more than the required number of teeth will be impossible

The countershaft accompanying this machine is of an improved form, the belt being kept tight by a weighted pulley sliding between ways. This is found very convenient for saving room. The driving pulley is 6¾″ in diameter, with 2″ face. The floor space occupied is 24″x48″, and the weight of machine complete is about 900 pounds. This machine was designed to meet the demand for a low-price machine to do first-class work.



WHITON'S IMPROVED GEAR CUTTING MACHINE.

The contest which for the past twenty years has been going on between heavy guns and armor plate for ships, reminds one, perhaps as much as anything, of the problem of an irresistible force coming in contact with an immovable body. Generally speaking, the guns have been ahead; but recently, and what may be considered as remarkable, in Italy, it is said that hardened steel armor has been constructed which will effectually resist projectiles from the heaviest guns.

Fire Protection of Machine Shops.

BY LEWIS F. LYNE.

While there are some machine shops and manufacturing establishments supplied with ample and efficient apparatus for extinguishing fires, there are hundreds of others that remain unprotected. Should a fire start within any of the latter, the shop is at the mercy of the flames, depending entirely upon outside assistance for quenching the blaze.

Generally, when a fire starts within a machine shop, or other similar establishment, the quantity of lumber saturated with oil, as well as other combustible material at hand, enables the fire to gain such headway that before the arrival of fire apparatus, the doom of the building becomes apparent.

Much valuable property has been destroyed from time to time because of an improper and unreasonable consideration of the first cost of an efficient fire apparatus. Some proprietors seem to believe that if they have a length or two of hose hung upon the wall at each end of the shop, that a conflagration will be next to impossible; or in other words, that the hose in sight is a sort of amulet or charm against the ravages of fire. I used to be employed in a machine shop where a hose-reel was attached by brackets to the wall at one end of the shop. Every night the watchman stretched the hose along the floor, attaching one end to a hydrant and a nozzle to the other end. After the workmen had retired, the watchman quietly retired to the engine-room, where he had an improvised easy-chair upon which he regaled himself with his pipe, finally dropping to sleep. In the latter condition he remained until awakened by his dog, who was far the best watchman of the two. Watchmen's time detectors were not used in this shop, and it was not proved that the watchman ever made a circuit of the shop at all during the night. Even if a fire had started and been discovered by him, the force of the water was insufficient to throw a stream ten feet from the nozzle, owing chiefly to an inadequate supply pipe.

Some people think that an array of fire buckets about a building has a remarkable effect in frightening away the fire demon. When these buckets (made principally of wood to save expense) are first put in place they are filled with water to be in readiness, as if a fire was expected in a day or so.

In the course of six months after these preparations have been completed, and no fire appearing, it is taken for granted that a mistaken apprehension has existed, so the water in the buckets, after disappearing by evaporation, is not renewed. Thereafter, when a person requires a bucket, he goes to the row of fire buckets to procure one, and generally is successful in securing the bail and the two attendant staves at the first grip, the remainder collapsing in a heap. This may seem to some like an exaggeration, but persons familiar with careless shop methods will readily see that it is not overdrawn.

In laying out the water-supply pipes for a building, extra allowance is seldom made for using large quantities of water, as in case of fire. I once knew of a large shop erected, with the buildings attached, where the water for supplying the entire establishment passed through a cast-iron pipe of 3″ diameter. To this pipe were attached six or eight fire hydrants, so that when two or more of them were opened the water would hardly clear the hose nozzles. There were no mechanical means of increasing the force of these streams, and they depended entirely upon the force created by the elevation of the tank. The company owning the buildings mentioned positively refused to put in a larger supply pipe, as also to put in one or more large fire pumps at convenient locations to be used in case of fire. It happened in the course of time that the 3″ pipe became partly filled with mud, and one night the watchman discovered fire near the roof. He could not reach it, and there being no force to the water he was compelled to stand powerless and witness the progress of the flames, which rapidly consumed the entire wood-work of the structure. It was a full hour before any fire apparatus could be brought upon the ground, and by that time property had been consumed to the value of $75,000 to $80,000. This is what I call mistaken economy, which practically means reckless extravagance.

A fire pump located in some convenient locality could have been used and was actually needed for many purposes about this shop, so that had it never been required for putting out fires it would have eventually

proved a paying investment; furthermore, when a fire was discovered, it could have been attacked at once and brought under control.

It is a well known fact that many of the most disastrous fires that have occurred could have been quenched with a single bucket of water if they had been properly attended to as soon as discovered. The fact is that in the erection of new buildings too little attention is generally paid to their safety against fire. Wood-work is frequently brought too near the brick-work of the boilers. I once knew a $20,000 fire to have occurred through the erection of a wooden partition close to the brick wall of the boiler. Through constant use the brick wall cracked at the furnace so that a spark set fire to the building. I can safely say that there was no more excuse for this fire than there would have been had the proprietor deliberately touched a match to the structure; it was the obvious consequence of unpardonable carelessness.

Small consideration may also be given to buildings well provided with fire extinguishing appliances. When once put in place it seems to be taken for granted that no further attention need be paid to the fixtures until they are required for fire extinguishing purposes. I have also noticed that in an emergency when the attempt was made to open the valves they were twisted or broken off, being securely held in place by corrosion.

The best of apparatus without frequent inspection will very soon become inoperative and will become worse than no apparatus at all, because the fact that it is there is one that creates a feeling of false security in the minds of the proprietors and others upon whom the security of the buildings depend. More careful judgment should be displayed in planning as well as in carrying out the details of construction in the erection of buildings to be used for manufacturing purposes. In those already erected a large and efficient fire pump should be located in the lower part of the building, with pipes communicating with each floor, if such building be more than one story high. Hose should be kept constantly attached, so that should a fire occur not more than one minute may be consumed before water can be put upon the fire. The expense of a reasonable fire apparatus is a good outlay, and if this fact were generally borne in mind by proprietors of manufacturing establishments we should hear of very few disastrous fires.

The Jones System of Boiler Setting.

In our issue of Dec. 10, 1881, we illustrated a system of boiler setting, in which the ordinary boiler front was protected from the destructive heat of the furnace by means of a peculiar system of hollow arch and jamb plates, which also served the purpose of dispensing with the part of the brick-work of the boiler setting, which from its exposed position is extremely liable to cause trouble by its failure. These hollow plates are in effect air shields, through which the cold outside air circulates, protecting the fronts and heating the air before delivering it at the bridge wall to assist in the combustion of the unconsumed gases. Since the ordinary boiler front as constructed to resist the furnace heat is unnecessarily heavy, and hence expensive, when protected from the effects of the heat by the air shields, the inventor, M. C. Jones, has recently commenced, in connection with the jamb plates and other parts peculiar to his system of boiler setting, the manufacture of a new front especially designed to meet the requirements.

This front, together with a new grate bar and a more general illustration of the boiler setting, is shown in Figs. 1 and 2 of the present engravings.

The front does not differ materially from the ordinary flush front, except in being quite light, and hence correspondingly inexpensive. The air, as shown by the arrows, enters the jamb plates, or air shields, through the front, and first circulating within them is finally delivered by means of suitably arranged passages into the hollow bridge wall; or, if desired, the air may, instead of passing to the bridge wall, be conducted under the grate and so to the fire. In either case the jamb plates are kept, by the circulation of the air, at a temperature so low as to protect the front from any injurious effects of the heat to which it is ordinarily exposed, and which so quickly warps, breaks and burns it out.

The grate bar, shown in Fig. 1, is V shaped, and so constructed as to present substantially a uniform section; an essential in resisting the tendency to warp from unequal expansion in the extremes of temperatures to which it is exposed. A peculiarity of the arrangement of this grate bar is the construction of the back bearer. This is of *U* section, with single openings of just sufficient size to admit a bar, so that when the whole are in place the inside of the bearer is effectually closed against the admission of any foreign substances, leaving a free space at the end of the bar in which it may expand or contract without resistance, and hence without a tendency to bend or buckle.

The appliances required in this system of boiler setting are furnished by M. C. Jones, of 97 Liberty street, New York.

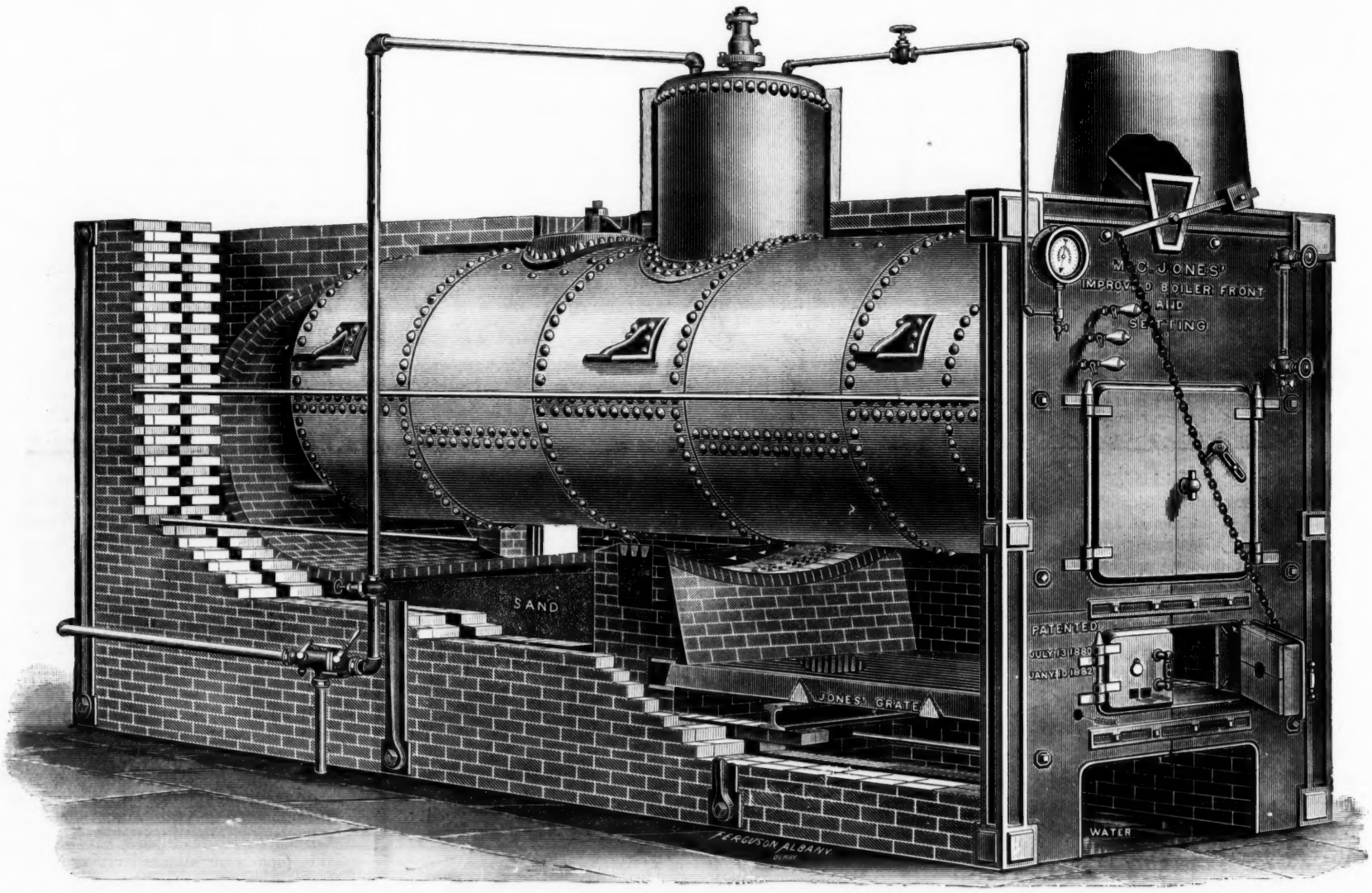


FIG. 1.—FRONT VIEW OF THE JONES BOILER SETTING.

Belt Boxes or Chambers.

Edward Atkinson, President of the Boston Manufacturers Mutual Fire Insurance Co. has issued the following circular to the mills insured in that company:

"The incidents of the fire in the Flint Mill disclosed the danger arising from belt boxes and hoods over pulleys more fully than any other loss which has yet occurred, mainly because the fire originated in a most unexpected place, under the fly-wheel of the steam engine, whence the belt boxes carried the fire simultaneously into each room in the main mill. A few days later, the breaking of a shaft in the Metacomet Mill canted a pulley against a hood and set it on fire. This fire was skilfully and promptly extinguished with pails of water; and, on breaking up the belt-box, a considerable quantity of very fine lint and dust was disclosed, of a kind not subject to very rapid combustion, but such as would make a great deal of smoke.

"The first impulse has been to ask the removal of hoods over pulleys, and that belt boxes should be cut down to a height of five or six feet above the floor; the area above the box where the belt issues into each room to be protected by special automatic sprinklers; but, upon making this change, two difficulties have been disclosed.

"1st. In many cases where main belts are carried through floors, a wide opening is made from room to room, which cannot be protected by a hatch or fire guard.

"2d. Where there is a very heavy pressure on automatic heads, they may crack or leak, and thus injure the main belt. This has happened in one case.

"The following suggestions are submitted after a full consideration of the subject by the officers and inspectors of this company:

"1st. A brick belt tower from which the power may be transmitted by shafts is obviously the safest mode of conveying power, but the construction of most of the existing mills precludes the adoption of this plan.

"2d. In ordinary cases, it is suggested that a belt chamber, as it may be called, shall be built of plank, solid to the height of four or five feet above the floor; above that, to the ceiling, sash fitted with two plates of glass—*i. e.*, double glazed, plates about one inch apart, except at the points where automatic sprinklers are placed, as hereafter advised; at such points the glass to be single, or omitted wholly. Automatic sprinklers may be placed within such chambers where the pressure of water is not such as to create a danger of leakage; otherwise, outside, opposite single plates of glass or openings, and so disposed as to throw the water into the belt chamber in case of fire. For this purpose, special heads may be constructed to give the right direction to the water.

"3d. Where belts are now inclosed in dark belt rooms, double sash, or single sash double glazed, of small size, should be placed in the walls, so that the inspectors can assure cleanliness within, and so that a fire may be quickly detected from without, and these rooms should be supplied with sprinklers.

"4th. Where belts are now inclosed in rooms of which the sides or front are of single glass, it is not essential to double the glass, although it might be expedient. The

theory of the double glass is that under heat the inner glass will crack some time before it breaks, while the outer glass remains solid and keeps the smoke and sparks from passing. On the other hand, the heat will pass quickly by the single glass or opening opposite the automatic heads, and perhaps let on the water before the outside glass is elsewhere broken.

"5th. Where each leg of a belt is boxed through one room to another and there is not sufficient space for a belt chamber, the automatic sprinklers may be placed so as to protect the point where the belt emerges above.

"6th. These rules may be sufficient for all ordinary cases, but there will be exceptional cases which must be made subject to separate inspection and treatment."

The Pennsylvania Railroad Company has begun building hospital cars, to be placed at convenient points on the main line and branches, in which injured employes may be placed until they can be removnd to their homes.

wine at Wilmington, Delaware. The road through the State of Delaware will be built under the charter of the Delaware Western Company, which is owned by the Baltimore and Ohio Company. In Maryland it will be built under the Baltimore and Ohio charter, and in Pennsylvania a corporation will be formed under the railroad law of the State. It is expected that the line will be completed before the close of 1883.

Steam Jackets and Economy.

At a recent trial of an engine made in Belgium on the Corliss system, the following details are given concerning the efficiency of the steam jacket: Working under average conditions, without the jacket, the engine developed 127.6 horse power, with a consumption of 24.7 pounds of steam per indicated horse power per hour. With precisely the same opening of the valves, and under otherwise exactly similar conditions, except that steam was admitted to the jacket, the work rose to 157.13 horse power, and the consumption of steam fell to 19.85 pounds per indicated horse power per hour, making in this way a gain of 19.6 per cent. A somewhat defective action of the steam traps existed the day on which these results were recorded. This trial was repeated the following day, and the consumption of steam fell to 18.96 pounds per indicated horse power per hour, making a gain of 23½ per cent., the amount of power being sensibly the same. Comparing the mean of these two days' work, the same engine did 23.7 per cent. more work with the jackets than without, while the saving of steam per indicated horse power per hour was 21.6 per cent. by the use of the jacket.—*Engineer and Iron Trades Advertiser.*

The last issue at hand of the *Australasian Trade Review* says:

"The general business of the colony continues sound. The quarterly mining returns show an improvemeut in the yield of gold as compared with 1881, which again was better than 1880; agricultural prospects are fair; industries dependent on pastoral interests of the colony, with one or two exceptions, are steady. Railway building, and other constructive works provide a considerable section of the population with highly-remunerative work, the accruing benefit passing on to the mercantile classes. But expansion no longer characterizes operations. A period of comparative dulness may now be looked for, for the following reasons: The European price of wheat is so low that colonial farmers can expect but a meager profit; the export meat trade, from which a high rate of profit might reasonably be expected, seems less inclined than ever to center in Melbourne; artificial development is at present far ahead of the current output of natural industries; a hardening tendency in the price of money is in course of growth, and will check enterprise, sound as well as unsound."

Recent newspaper reports (evidently originated to influence the stock market) to the effect that mills and shops in Chester, Pa., had shut down, owing to depression in business, prove to be entirely unfounded. Some of the woolen mills closed a week for repairs. The machine shops, foundries, and boiler shops are all driving ahead with a full force of workmen.

"The amount of capital which has been invested in railways in the past year is almost incredible," says the *Railway Age*. "Allowing $25,000 per mile as a fair average for the cost of a road, equipped and in operation, the 10,800 miles of which we have record have cost $270,000,000, to which is to be added the vast and unknown sum expended in preparing road beds on which track is not yet laid."

The *Ironmonger*, in its Birmingham report, says: "Machine tools are in steady request, and the makers of lathes, drills, gun rifling and shaping machines are mostly busy. In bench-tools, stocks, dies, ratchet-braces, spanners, tube-cutters, &c., business is rather quieter, but the leading makers continue for the present well engaged."

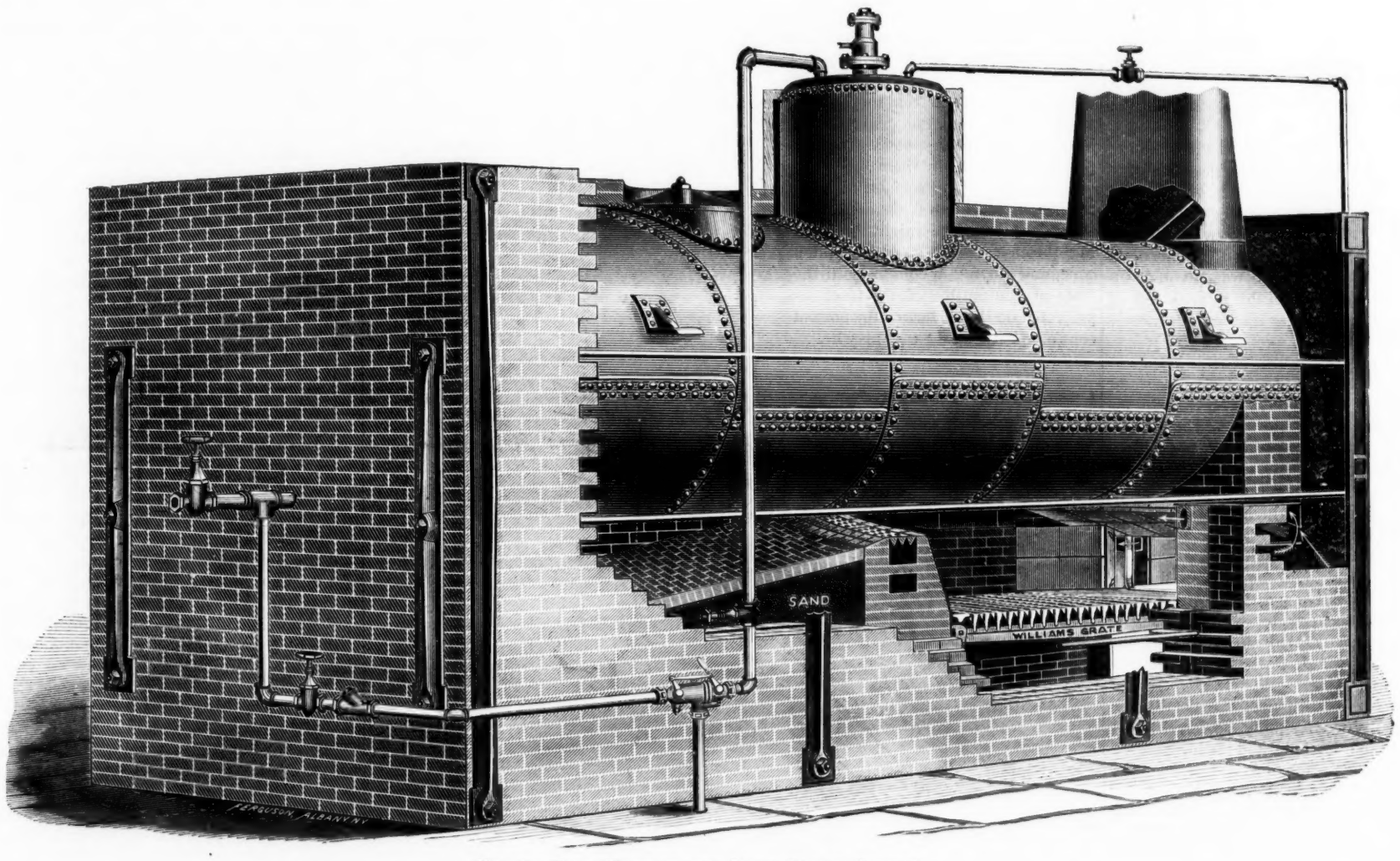


FIG. 2.—BACK VIEW OF THE JONES BOILER SETTING.

Prison Contract Legislation.

State Legislatures are coming to realize that they cannot much longer stave off the earnest consideration of the prison labor contract system in the interest of free labor. Shouldering off the responsibility upon a committee instructed to report next year, or two years hence, when the public shall have forgotten the existence of such a committee, will not longer serve to allay the apprehensions of those suffering from unjust prison competition. Productive industries demand a reform of the prison labor system.

Immediately after the meeting of the New York State Legislature, last week, a bill was introduced in the Senate prohibiting the hiring or letting of convict labor in reformatory institutions, prisons or penitentiaries, to contractors. The people will watch with great interest what action is taken upon this question.

The Baltimore and Ohio Railroad Company is making active preparation for the construction of its Baltimore and Philadelphia extension. A bridge, 100 feet high and 500 feet long, is to be built across the Brandy-

Two systems of so-called controlled combustion are at present, to some extent, being applied to steam boilers in this country, which are chiefly noticeable for the different views entertained by their respective inventors. In the Mallett system, economy is claimed to result from supplying air to the furnace at a pressure less than that of the atmosphere; while in the other, the Zell system, equal economy is claimed from supplying air at a pressure considerably greater than that of the atmosphere. Before revising cherished opinions on this subject, it will perhaps be as well to wait until either or both systems demonstrate their economic value.

The business streets of New York City are not supposed to furnish good mining claims, lodes, or drifts, yet the industry displayed in digging up Fulton street, as visible from the windows of our office, since last July, would be sufficient to develop the wealth of any ordinary gold or silver mine. The electric light, steam heating, and gas companies have, together, succeeded in keeping the street in an almost constant state of excavation. We have not seen any evidence as yet that any of them, with the exception of the gas companies, have struck "pay dirt." The formerly smooth Belgian pavement has become, by reason of repeated relaying, about as rough as a plowed field.

Some interesting experiments have been recently made on French railways with an electric alarm, invented by M. Mors, forewarning the approach of trains. This ingenious though simple apparatus consists of a box filled with mercury, which is placed under the rail at any desired distance from the signal bells. In consequence of the vibration when a train is passing the mercury contained in the box is much agitated, and makes an alternating connection with the wires which are in communication with the bells.

The Hartford *Courant* says: "Since the steam-heating men began to get in their work, New Yorkers can sing with new fervor the words of the old hymn:

> 'Beneath our feet and o'er our heads
> Are equal warnings given.'

"When they take their walks abroad of a morning it is with a pleasing uncertainty as to whether an elevated railroad locomotive will tumble on them, or an underground pipe explosion send them kiting skyward in an environment of paving stones, apple stands, curbstone venders, and other wreck and rubbish."

Variable Bevel Gears.

BY A. J. SHAW.

The gear described in the following article was designed by the writer some three or four years since, while in the employ of the Chandler & Silver Water Motor Company, and while it is not claimed that it is a perfect gear, it is presented with the hope that it may not be without interest, as a method of meeting a certain condition in a manner not before attempted.

It cannot be employed to communicate motion where the velocity ratio is other than unity, but where shafts are required to swing or change their relative angular position, it may in some cases be employed with good results.

Its defects are that, owing to the necessarily large slope of the acting faces of the teeth, there is a crowding or end pressure on the shafts, and that for some positions the back lash or clearance becomes excessive, although of course where there is a steady resistance to be overcome this defect would not be apparent.

It works well at the same angles as the ordinary universal, or Hooke's joint, but unlike that, the relative angular velocity of the driving and driven pieces is the same at all parts of the revolution.

The peculiar construction of the Chandler & Silver Motor, of which this gear is a part, required that a regular rotary motion should be communicated from one piece to another, while one of them was free to swing through an angle of some 30°, and that the axis upon which the swinging shaft was pivoted, instead of passing through the intersection of the axis of the driving and driven pieces, should be at one side.

Several sets of gears of this type of various sizes from 6″ to 18″ diameter and from 1″ to 2½″ pitch have been running for from one to three years at from 150 to 450 revolutions per minute, and have worked as quietly and satisfactorily as cast gears generally do.

Referring to Fig. 1 which shows a pair of gears of this type—one in elevation, the other in section, with a half plan of same,—*A*, *B* is one, and *A*, *C* the other of the two gears in the relative positions which they occupy when the angle between them is the greatest; and the dotted outlines, *A*, *E*, the positon of the gear *A*, *C* when at a minimum angle with *A*, *B*.

For any given position of the gears, they may be considered simply as bevel gears with some modifications, and the intersection of the axes may be taken to be the common apex of the cones of the pitch surfaces. But it is evident that as the gears come closer and closer together they act more and more nearly as a clutch, and that if we design the outlines of the teeth suitable for the greatest angular position the gears will occupy, and give them a suitable form, they will work correctly at all angles less than the maximum.

Now as the gears are opposite and similar, if we take *P*, *O* passing through the trace of the axis *A*, and bisecting the angle between the two gears, it will cut the axis of both gears at their intersection. The line *O*, *P* is then the trace of the pitch cone, and if through *P* we draw *P*, *N* at right angles to it, *P*, *N* will be the trace of the normal cone. The line *O*, *P* is also the instantaneous axis of both gears relative to each other.

In laying out the forms of the teeth, both of spur and bevel gears, the surface upon which is projected the outline of the tooth is taken as normal to the instantaneous axis. With spur gears this surface is a plane, and with bevel gears it is a sphere whose center is the apex of the pitch cone, although in practice it is usually taken as the surface of the normal cone. In delineating the teeth of gears the side of this normal cone is taken as the acting radius of the pitch circle.

As the angle between the gears varies, the length of both the pitch and normal cones varies with it, the side of the normal cone lengthening as the angle decreases, and shortening as the angle increases, and as this distance *N*, *P* is the acting radius, the diameter of the pitch circle is also variable.

Now there is but one form of tooth which permits the diameter of the pitch circle to vary, while the action of the gears remains unchanged, and that is the involute.

If, then, we project the axis *N*, *O*, of the gear on the normal gear at *m′*, *N′*, and construct the trace of a tooth of the involute series *m′*, *n′* (with *i*, *i′* as the base circle), we shall fulfil the necessary conditions.

But in spur and bevel gears, with involute teeth, the line of movement of the pitch circle is a straight line, at right angles to the instantaneous axis; and in this case the line of movement for all positions must also be at right angles to this axis.

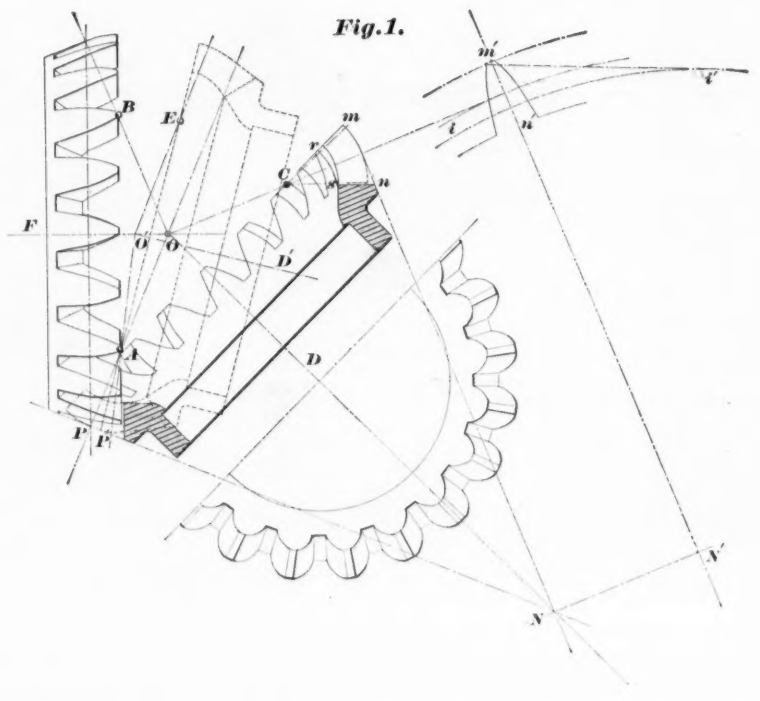
We have already found that the instantaneous axis lies in the surface of the pitch cones, and is the line of contact of which *P*, *A*, *O* is the trace, but this line always passes through the point *A*; therefore, the line of movement of the pitch circle, being continuous and at right angles to *P*, *A*, must be a circle of which *A* is the center and *P*, *A* the radius.

From this it follows that the depth *m′*, *n′* of the tooth is the development of the circle *m*, *n* on the normal cone.

Strength and durability demand that the contact of a pair of teeth should be a line, and from this obtains the condition that the gears should have a face corresponding to the power transmitted by them.

In bevel gears the surface forming the face of any tooth is developed by the movement of a straight line passing through the apex of the pitch cone, and moving in contact with the trace of the outline of the tooth, as projected on the surface of the normal cone or sphere, as the case may be.

Fig. 1.



In the present gear, while it is impossible that this developing line should always pass through the apex of the pitch cone, it must always cut the axis of its gear; and when it passes through the pitch circle it will pass through the apex of the pitch cone, as it then forms an element of the surface of that cone.

As both gears have a common swinging movement about the axis *A*, in order that the rectilinear elements of a tooth in one gear may for all angles coincide with an element of a tooth in the other gear, during the passage along the line of contact, it is necessary that all the rectilinear elements of each tooth shall pass through the common line of movement of both gears, or the circle of which *A* is the trace.

From this it follows that the face of the tooth is a warped surface developed by the movement of a line, always in contact with three other lines, viz., the outline or trace of the tooth, projected on the surface of the normal ring, which is generated by the revolution of the arc of the circle *m*, *n* about the axis *O*, *N*, a circle tangent to the swinging gear, of which *A* is the trace, and the axis of the gear.

Having thus imperfectly sketched out the principles involved in the design of the gear, the next step will be to describe the practical method employed in laying out and constructing the same.

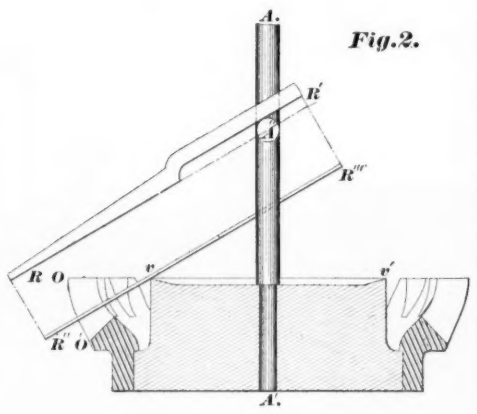
The first part of the process is the same as employed in designing a pair of bevel gears of equal size, the angle between the gears being taken at its maximum.

The center *A* being fixed, sketch in the angle *E*, *A*, *B* between the gears, when this angle is a minimum. Then, having decided upon the radius of the normal curve *m*, *n*, give the teeth such an addendum and length of flank as shall serve to keep them either from drawing apart or from bottoming when at the extremes of vibration.

This having been done, the pitch and number of teeth is to be decided, which is to a great extent controlled by the depth of the tooth. The points of the teeth have usually been made thin, in order to keep the pitch as small as possible.

Now rectify the arc in *m*, *n*, and, having drawn the projection of the axis *O*, *N* on the normal cone at *m′*, *N′*, lay off *m*, *n* as *m′*, *n′*, and, considering *N′* as the virtual center of the gear, from the proper base circle *i*, *i′*, lay off the outline of the tooth *m′*, *n′* an involute by any method. This outline is to be used as a templet for the forming of the teeth of the pattern.

Fig. 2.



Having turned up the outline of the pattern of the proper form (see Fig. 2), get out a circular block, such that the edge *v*, *v′* shall occupy the position of the circle to which the line of oscillation *A*, Fig. 1, is tangent. Then, in the axis of the gear, erect a spindle *A*, *A′*, and make a straight-edge or ruler *R*, *R′*—*R′*, *R′*, with an offset to lie against the vertical spindle, such that the edge *R* prolonged would cut the axis of the gear.

Having, with the templet before described, laid off the outline of each tooth on the surface *O*, *O′*, the clearance between the teeth is to be cut away until the straight-edge, being applied in contact with the spindle *A*, *A′*, the edge *v*, *v′* and the outline *O*, *O′* will touch the surface of the tooth for its whole breadth. The face of the tooth must not be made too broad nor brought too near the circle *A*, *C*, Fig. 1, lest the obliquity become excessive, as, if the breadth of tooth is such as to reach *A*, the tooth at that end would have no depth, while the pitch would diminish only in the radii *O*, *A* and *O*, *P*.

By a similar process a gear could be designed such that the teeth should lie entirely inside the line of oscillation *A*, if for any reason this should be found desirable.

LETTERS FROM PRACTICAL MEN.

Tool Post Misconstruction.

Editor American Machinist:

Now that the minds of your readers are being directed to the subject of machine tool construction, I wish to call attention to what seems to me to be a matter of some importance. In looking over the illustrated advertisements of engine lathes in the mechanical journals, I find that few of them show a construction of tool post adapted to the wants of the times.

I find, in nearly every case, a block of iron gibbed to the carriage, and having the usual slot in the upper surface for receiving the head of the usual tool-post stud. So far so good, but just here is the weak point. Adjustment for height of tool is effected by as shiftless a contrivance as ever fell to the lot of a machinist to waste time upon. I refer to the stepped collar which supports the cutting tool, and which tips the tool up or down, as the case may be. How much time and temper is wasted in blocking up for each particular tool, which has to be done, as each—even if forged to the required height—will become lower by grinding, &c., so as to become practically useless unless blocked.

In calling attention to this point in tool construction, I believe I am but expressing the feelings of hundreds of workmen in our shops, who are crying out daily against this radical defect in this the most useful of machine-shop tools.

What is the remedy? It lies with you, gentlemen, who, for the sake of a few dollars difference in the first cost, buy, forgetting the daily vexation to workmen in your employ, and the diminished product of your shops. We all know that lathes have been in the market for years in which the tool is supported horizontally always, and in which adjustment is accomplished without loosening the tool. C.

Machine Tool Notes.

Editor American Machinist:

The great trouble in turning and boring hard tire is not so much want of power, as to get tools to preserve their cutting edge. The plan of grinding them was tried in Swindon, England, 40 years since, and abandoned. I see they have been fitting up a grinding emery wheel machine in Austria for the same purpose, but it is decidedly slow. Krupp's steel tire can be turned easily enough. It is the makers of unequal material, with hard spots, that plays the mischief with the tools, and old, badly worn tire that the shoe-brake and sand have been liberally applied to. There can be no doubt that a wheel lathe could be made of sufficient weight, power and rigidity, with duplex slide rests on each tire, that could perform the work of half a dozen old-time lathes.

If Mr. Shanks's 24″ center marine shafting lathe weighs 100 tons, it is evident that our wheel lathes might be made much heavier with great advantage, especially in the bed and saddle, or carriage.

The tail stock ought to be made so as to have the spindle project as little as possible, and the slide rest tool-holders made with bolts and steel clamps, so as to take a short bite of the tools.

I see some of the English builders have cast-iron pieces, with a large hole, bolted on the face plate and wrought iron studs to fit, that can be pulled out or shoved in to clear the spokes of the wheel in taking them out and in. Heavy cutting with slow speed and quick feed, is a mere question of power and rigidity. The question is how to make the tools stand; whether to cut dry or wet, and

the proper shape, clearance, angle, etc., of the cutting edge, and the thickness and amount of steel behind the edge to prevent the tools from softening.

Taking dry cuts on wrought iron is more common in this country than in Britain; also more use is made of the file here. Less oil and more soapy water is also used there on many jobs.

A man informed me that he saw a cut taken off a shaft at a navy yard, on one of Seller's lathes, 1⅛ deep, with a feed of eight to the inch, and he said it was as clean turning as he ever saw. It is the double tools—the one on the back ¾" cut, and one on the front ¾"—that enables the Shanks lathe to be used with such a feed.

Double cutters for boring on such work as car wheels, brasses, quartering drivers, etc., are much better than single ones. Knocking out single cutters with a hammer every time is a slow plan, and not so accurate. It is just as easy to quarter new driving wheels all of a size as otherwise. Then the pins could be all turned to standard gauges, and would fit anywhere, the same as car wheels.

Mr. Shanks says they have frequently turned cast-iron rollers 18½ feet long and 28 inches diameter in two hours and a half.

I suppose the journals are run in bearings, to take the strain off the centers. He does not say whether they take one or two cuts.

Fort Wayne, Ind. VETERAN.

Rough Joints—Adjustable Indicator Rig.

Editor American Machinist:

Quite a number of practical men have recently given us the benefit of their views through the columns of the AMERICAN MACHINIST, upon materials for foundation joints. In making rough joints of that kind, paper is much superior to babbit metal, sulphur, or anything else within my knowledge. I take good, coarse, *long fiber* manilla paper, soak it thoroughly in water, and place in the proposed joint, and draw the bolts down gradually and evenly all around.

The paper should be long fiber and tough, so that when soaked it will not be mushy and squeeze out. The bolts will need drawing up every day for two or three days, owing to the drying of the paper. Caution must be exercised to avoid warping the casting in drawing it down evenly. If properly done, this makes a joint that will stand any amount of severe treatment, and all kinds of strains that are likely to be brought to bear upon it in ordinary practice.

In making flange joints upon piping, it is almost a universal practice to make the flange faces straight across, or what is better, with a few rings cut in with a sharp pointed tool. In making such a joint one of the faces should be chambered or recessed to a depth of at least half the thickness of the proposed gasket material. This successfully prevents both the spreading and blowing out of the gasket. I remember one instance in particular where there was a charging hole in a chemical tank closed by a screw plug of brass six inches in diameter. This plug had a rim ¾" wide at the top; between this rim and the head of tank a gasket was to be placed. If the plug was screwed up tight and refused to hold the pressure, is must be tightened still more. This was likely to squeeze the gasket out. My remedy for this difficulty was to chamber or recess the flange on the plug $\frac{1}{16}$" deep and $\frac{5}{16}$" wide, using gum packing $\frac{1}{8}$" thick, screwing the plug down until it could not be made any tighter. As the shop men say, "It was put there to stay."

In your issue of Dec. 30, 1882, I read a description of an adjustable indicator rig. I wish to offer one that I have used, but have never seen it described in any paper.

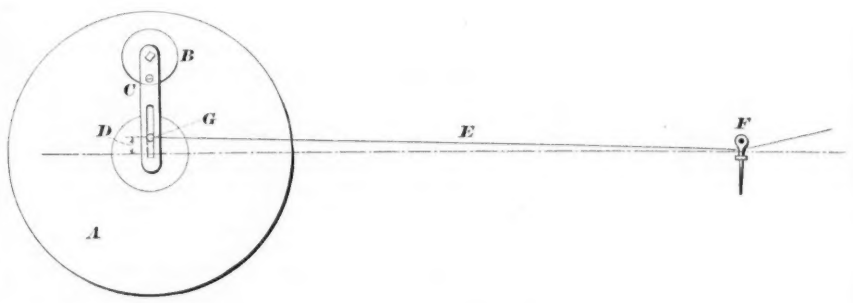
Referring to the accompanying sketch, *A* represents the crank, of the disc form, and *B* the crank-pin.

I drill a hole in the center of the crank-pin and tap it out with a half-inch tap. I then bolt on a strip of iron, *C*, which forms a return crank. This strip of iron has a slot in which is an adjustable pin, *G*, for attaching the indicator cord. The return crank is prevented from slipping by a steady pin driven into the face of the crank-pin, as shown. It will be observed that a center line drawn through the center of crank-pin and center of shaft, also passes through the center of the bar *C*. The indicator cord *E* is attached to the pin *G* by a loop, from which it is led off through a pulley or screw eye *F*, to the indicator. By adjusting the pin *G* in the slot, any desired length of diagram can be readily obtained. The distance between the center of shaft and that of the pin *G*, as shown at *D*, will be half the length of diagram. The motion of the drum will be identical with that of the piston, only reduced to the size of card wanted. M. C. R.

Cincinnati, O.

TABLE OF ACTUAL EXPANSION RATES.

Per Cent. of Clearance.	POINTS OF CUT OFF.															
	.10	.125	.20	.25	.30	.333	.375	.40	.50	.60	.625	.70	.75	.80	.875	.90
.01	9.181	7.481	4.809	3.884	3.258	2.944	2.623	2.463	1.983	1.655	1.590	1.422	1.328	1.246	1.141	1.109
.0125	9.	7.363	4.764	3.875	3.24	2.930	2.612	2.454	1.975	1.653	1.588	1.421	1.327	1.246	1.140	1.109
.0150	8.826	7.25	4.720	3.830	3.222	2.916	2.602	2.445	1.970	1.650	1.585	1.419	1.326	1.245	1.140	1.109
.0175	8.659	7.133	4.677	3.803	3.204	2.902	2.592	2.436	1.966	1.647	1.583	1.418	1.325	1.244	1.140	1.108
.02	8.5	7.034	4.635	6.777	3.187	2.889	2.582	2.428	1.961	1.645	1.581	1.416	1.325	1.243	1.138	1.108
.0225	8.346	6.932	4.595	3.752	3.170	2.876	2.574	2.420	1.956	1.642	1.579	1.415	1.324	1.243	1.138	1.108
.0250	8.2	6.833	4.555	3.727	3.153	2.863	2.562	2.411	1.952	1.640	1.576	1.413	1.322	1.242	1.138	1.108
.0275	8.088	6.732	4.516	3.702	3.137	2.850	2.552	2.403	1.947	1.637	1.574	1.412	1.321	1.241	1.138	1.107
.03	7.933	6.645	4.417	3.678	3.121	2.837	2.543	2.395	1.943	1.634	1.572	1.410	1.320	1 240	1.138	1.107
.0325	7.792	6.555	4.440	3.654	3.105	2.824	2 533	2.387	1.938	1.632	1.570	1.409	1.319	1.240	1.138	1.107
.0350	7 666	6.468	4.404	3.631	3.089	2.812	2.524	2.379	1.934	1.629	1.568	1.408	1.318	1 239	1.137	1 106
.0375	7.545	6.390	4.484	3.608	3.074	2.800	2 515	2.371	1.930	1.627	1.566	1.406	1.317	1.238	1.136	1.106
.04	7.428	6.303	4.333	3.58	3.058	2.788	2.506	2.363	1.925	1.625	1.563	1.405	1.316	1.238	1.136	1.106
.0425	7.315	6.229	4.298	3.564	3.043	2.776	2.497	2.355	1.921	1.622	1.561	1.404	1.315	1.237	1.136	1.106
.0450	7.206	6.147	4.256	3.542	3.028	2.764	2.488	2.348	1.917	1.620	1.569	1.402	1.314	1.236	1.135	1.105
.0475	7.102	6.082	4.232	3.521	3.014	2.752	2.479	2.340	1.913	1.617	1.557	1.401	1.313	1.235	1.135	1.105
.05	7.	6.	4.2	3.5	3.	2.741	2.470	2.333	1.907	1.615	1.555	1.400	1.312	1.235	1.135	1.105
.0525	6.901	5.985	4.168	3.478	2.986	2.730	2.461	2.325	1.904	1.613	1.553	1.398	1.311	1.234	1.134	1.104
.0550	6.806	5.861	4.130	3.459	2.971	2.719	2.453	2.318	1.900	1.610	1.551	1.397	1.310	1.233	1.134	1.104
.0575	6.714	5.794	4.106	3.439	2.957	2 708	2.445	2.311	1.896	1.608	1.549	1.396	1.309	1.233	1.134	1.104
.06	6.625	5.729	4.076	3.418	2.944	2.697	2.436	2.304	1.892	1.606	1.547	1.394	1.308	1.232	1.133	1.104
.0625	6.538	5.666	4.047	3.407	2.931	2.686	2.428	2.297	1.888	1.603	1.545	1.393	1.307	1.231	1.133	1.103
.0650	6.454	5.605	4.045	3.380	2.917	2.675	2.420	2.290	1.884	1.601	1.543	1.392	1.306	1.231	1.132	1.103
.0675	6.373	5.545	3.990	3.362	2.904	2.665	2.412	2.283	1.881	1.599	1.541	1.390	1.305	1.230	1.132	1.103
.07	6.294	5.482	3.963	3.342	2.892	2.655	2 404	2.276	1.877	1.597	1.539	1.389	1.304	1.229	1.132	1.103



"Limiting Passenger Rates."

Editor American Machinist:

In an editorial under the above title, in your issue of January 6, 1883, you assume that all passengers pay full tariff rates for the service received, which is a common mistake, and one which really covers the true cause of the trouble. [We only assumed that in Texas the railroads are by law allowed to take three cents a mile for every passenger.]

I have no doubt that, with very few exceptions, a rate of three cents per mile for passenger service would be satisfactory to the railroads, provided it was paid in all cases; but, as a matter of fact, the few who do buy and pay for their tickets are required, in a large measure, to cover the expense of carrying the "deadheads."

It may be taken as a rule that the following classes of Western travelers hold annual passes over such roads as they have occasion to use most, and "trip passes" over other roads when wanted, viz.:

Politicians and such persons as are supposed to have political influence; journalists, stock-raisers and merchants, who are fortunate enough to have a choice of two or more railroads by which to ship their goods.

In many cases the pass is also extended to the family of the holder, which reduces the paying class to a comparatively small number; and I remember on one occasion counting more than thirty passes in a car containing less than fifty people, which, although an exceptional case, was not so far from the average as most people would suppose.

Now, it seems to me the most equitable method of settling the question would be to fix a reasonably profitable rate for passenger service, and prohibit the giving of passes or equivalent concessions to any but people traveling on strictly railroad business.

There is little probability that such a law will appear on the statute books of this country at present, for the very good reason that the makers of the law would be the greatest losers. J. G. L.

Boston, Mass.

Table of Actual Expansion Rates.

Editor American Machinist:

It ought to be well known that the "nominal" and the actual expansion rates are widely different, owing to the influence of clearance; so that where the point of cut-off is known, the expansion rate due to that has to be modified according to the proportion of clearance.

The shorter the stroke, and the earlier the cut-off, the greater the influence of a given clearance volume (not proportion) in the expansion rate; and the earlier the cut-off the greater the influence of a given proportion of clearance volume, compared with the piston-displacement.

The accompanying table, a part only of which has been published, was calculated for use in our office. It shows the actual expansion rates (neglecting piston-rod area, throttling, wire-drawing, internal condensation, condensation from radiation, &c.) at various cut-off rates and for various percentages of clearance. R. GRIMSHAW.

Technical Schools, Patents and Roofs.

At a recent meeting of the American Institute Polytechnic Association, the president, Mr. Stetson, called attention to the evening schools of New York City for industrial drawing; the Cooper Institute Free School, the smaller but excellent Mechanical Society Free School, 18 East 16th street, and the Metropolitan School of Art, East 34th street, near Third Avenue; also to one pay school for mechanical work, the New York Trade School, at First Avenue and 66th street, held on Monday, Wednesday and Friday evenings, teaching bricklaying, plumbing and painting.

A recent official ruling of the French Patent Department forbidding the use of photographs for patent drawings was averred to have been the rule of the United States patent office for some years. Ordinary photographs fade, and photo-lithographs have a roughness which is objectionable in the reproductions by the same process. They require India ink drawings made with very black ink laid on with the pen. French patents require the drawings to be made to a scale—the metric scale.

The president explained how nothing is lost by very specific descriptions, giving the best preferable dimensions and materials so far as known or judged, provided the claim is sufficiently broad and general. One of the stereotyped objections to a patent when sued upon is that there is no invention set forth in sufficiently clear and exact terms to allow its successful practice by ordinary persons skilled in the art, which it claims to be an improvement upon. If true, the objection is fatal.

Several speakers referred to the internal framing of the dome of the Capitol building, at Washington. The exterior shell was designed for grace and majestic effect, without any regard for stength. The interior, however, was a stout frame curved without regard to beauty but made entirely to obtain an arch of equilibrium; this supported the other by struts of proper lengths.

Felt, coal tar and gravel made a good covering for flat roofs. It was tolerably fire-proof as to fire applied from outside, but much remained to be done to avoid the present rapidity of destruction of the roofs of large buildings by fire within. The Manhattan Market building seemed to melt down instantly. The Crystal Palace roof fell about ten minutes after the fire was discovered. The wooden Mansard roofs on the top of the otherwise fire-proof buildings conduced greatly to the destruction in the great Boston fire. The Boston Custom House has a roof of heavy granite blocks. The Girard College is roofed with thick marble, supported on brick arches.

Insurance companies consider stout wood columns more able to withstand a short severe heat than iron. All commended the double iron columns, one within the other, which have been introduced to a large extent, the inner one to keep cool and support the roof and other parts after the outer metal is heated so as to impair its strength.

According to the Rome (N. Y.) *Sentinel*, a curious difficulty has been experienced with some of the water-works' hydrants of that city. The underground drips were found to be stopped up, and, upon looking for the cause, it was discovered that the roots of elm trees had grown into the holes, in some instances having to be drilled out.

It is claimed for the system of electric lighting of railway trains on the Eastern Railroad of France that a very important saving is made over the use of oil. There is in use a Gramme dynamo machine, driven by the locomotive, and Faure accumulators. By means of an automatic interrupter the accumulation is stopped when the train is running slower than its nominal speed, and the full power is required to draw the train, the accumulators at that time supplying the current, which is restored when the train attains full speed.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE AMERICAN MACHINIST.

The Yale Lock M'f'g Co. (Manufacturers, Engineers, and Machinists, and proprietors of the Emery Scale Company), Stamford, Conn., write us:

As to our general business, it will suffice to state that during the year just closing it has been large and satisfactory, and fully up to the productive capacity of our works. We have added considerably to the number of our hands, and now have some 550 employed in our various departments.

We find it is not yet generally known that during the past five years we have entered upon several new and important lines of work. Among these is the building of cranes of all kinds and capacities, under the patents of our Mr. Thomas A. Weston, best known as the inventor of the Differential Pulley Block. In this field we have developed a radically new type of traveling crane, for operation both by hand and power, which is in many respects far in advance of anything heretofore done in this direction. Of these we have at present under construction in the works: three 15 ton, two 20 ton, and two 25 ton traveling cranes, all of them for operation by power, and of spans ranging from 25 to 71 feet.

Of more general interest to the engineering public is the fact that, during the present year, we have entered into arrangements under which we intend developing the numerous inventions in scales, gauges, and testing machines of Mr. Albert H. Emery, the inventor and designer of the celebrated Government testing machine in the arsenal, at Watertown, Mass., the wonderful accuracy and power of which have excited such widespread interest, and the results already obtained from the use of which have demonstrated the unreliability of much of the information relating to strength of materials which have heretofore been relied upon. We are at present building, in our works, three 50-ton Emery testing machines, and, as rapidly as we can make room for the work, propose building other and larger testing machines, and also a full line of scales and other weighing machines, and of steam and other pressure gauges. Our plans in each of these directions aim not merely at producing new and important designs, but at the attainment of a higher standing of work, and of more accurate and reliable results than have ever heretofore been accomplished.

With a constantly-increasing demand for our older products, and with the development of these new lines of work, we anticipate an abundant employment of all our activities during 1883.

The Brown & Sharpe Manufacturing Co. (Machinery and Tools), Providence, R. I., write us:

We are still busy in all lines, though not so much pressed as last year. Our product will be considerably larger than in previous years. The number of hands employed is about four hundred. The prospects for business during 1883 seem fair.

Robert W. Gardner (Steam Engine Governors), Quincy, Ill., writes us:

The increase in my business during the year 1882 over the year 1881 has been about twenty-five per cent. During the past year I have put in my works a large lot of special machinery; have erected a large foundry, and a much larger factory is contemplated, and will be built next spring.

At present I employ 100 men, which will be greatly augmented when my new factory is completed.

The demand is constantly increasing, and at this writing I have orders for over 900 governors on my books. The outlook is cheerful, and there is every indication that the year 1883 will be a prosperous one.

E. Gould & Eberhardt (Machinists' Tools), Newark, N. J., write us:

During the past year we have been compelled to enlarge our works and extend our facilities to meet the demand for our new design of tools. We have also added about a dozen new tools of latest design to our plant, and are now selling off the old tools and replacing them with our more modern machines. We intend putting in a seventy-five horse power automatic engine of the simplest and best construction, to save fuel (and not wear out in a few years), and give us more power, if we can find such an engine.

The outlook for the year is not quite as promising as it was *last* year, but we do not complain, as we have a share of what there is in the market. We have quite a lot of orders on hand for our 16″ lathe, which "takes *the cake*," our customers say; also for planers and patent universal automatic gear cutters. We will ship one of the latter, a 50″, to fill an order for one of the best tool builders in France, and have also shipped a 30″ and a 40″ to our Eastern friends.

We have reduced our prices on some of the tools to meet the views of other good builders.

The Akron Iron Company (Bar and Pig Iron and Patent Hot Polished Shafting), Akron, O., write us:

The year 1882, just closing, has been as prosperous as any we have ever experienced. The demand for our product has kept ahead of our ability to manufacture, although during the year our entire capacity has been increased forty per cent. and our capacity for turning out shafting has been increased fully one hundred per cent. During the summer months we put in an entire new train of twelve-inch rolls with engine, an additional battery of boilers, and a number of special tools for cutting and straightening shafting, besides largely increasing our warehouse facilities. Notwithstanding all our heavy extensions and additions, orders have been pouring in on us faster than we could take care of them, and the recent depression, that seems to have affected many trades, does not seem to make much difference with us.

In our merchant iron department we have assured orders sufficient to take up our entire product in that line to July 1, 1883, running night and day, and our orders for hot polished shafting seem to be as proportionately numerous as they have been at any time since we commenced manufacturing that specialty. In fine, we look for a splendid trade during 1883, and while margins may be rather close, we look for a very heavy volume of business.

The Cleveland Twist Drill Company (formerly Cox & Prentiss, J. D. Cox, Jr., and Newton & Cox), Cleveland, O., write us:

Since January last we have discontinued the building of machine tools (planers, milling machines, &c.), in order to make room for our rapidly increasing twist drill business. We have cleared out our third story and stocked it with new and improved machinery specially adapted to our work, and in spite of these improvements and additions we are still unable to fill our orders, and will be obliged to carry over a large number of unfilled orders into 1883. We hear a good many complaints of dull times among machine shops in this part of the country, but have not felt it yet ourselves. Collections are very slow and money seems a little scarce.

The New Haven Manufacturing Co. (Machinists' Tools), New Haven, Conn., write us:

Our business for 1882 has been the largest and most successful in the history of this company, now closing its thirty-first year. We are now running up to our maximum capacity, having all the orders we can take care of, and to us the outlook seems very favorable. We find prices of the best material to be comparatively steady, and wages for competent and reliable machinists are as high as they have been. We trust your inquiries may result in giving evidence that the general manufacturing and mechanical business of the country is in a fairly prosperous condition.

The Norwalk Iron Works Co. (Steam Pumps, Air Compressors, etc.), South Norwalk, Conn., write us:

We have been busy during the whole of the past year. We have added to our machinery a 40″ boring mill of our own make, a 42″ lathe by Ames, a 32″ drill by Pond, a 45″ drill by Sellers, a cutting-off machine by Hurlbutt & Rogers, and also made extensive additions to our small tools and shop cranes. The New Year finds us "happy."

The Long & Allstatter Co. (Agr. Implements, Power Punches and Hammers), Hamilton, O., write us:

Our business for the year 1882 shows a very gratifying increase in all departments. We found it necessary to enlarge our facilities in the foundry and machine departments, particularly for the construction of heavy machines. We have fully the average of unfilled orders yet on our books, and a good prospect for 1883.

Fay & Scott (Machine Tools), Dexter, Me., write us:

We take pleasure in informing you that our business during the year 1882 has been all that we could wish, inasmuch as we have had all that we could do and have orders now (on shapers) extending 4 months into the year 1883. During the year 1882 we increased our facilities by the addition of several new tools, and shall make further additions this year if business holds good. We can see no reason why our business does not promise as well or better for 1883 than it did a year ago.

The American Steam Gauge Co. (Gauges, Indicators, Planimeters, etc.), Boston, Mass., write us:

During 1881 and 1882 our business increased each year at least 40 per cent. over that of any year since the big fire of 1872; and, in order to supply the increase, we have been obliged to add largely to our supply of help, tools, machinery, etc.

A large part of our business, especially during 1882, consisted in the manufacture of sets of large size instruments, one of which was a set of 12″ dial instruments for the new steamer Pilgrim, built by John Roach & Son for the Fall River Line.

The demand for our Improved Thompson Indicator has far exceeded our highest expectations; and largest part of the increase of machinery, etc , was made to facilitate the furnishing of the indicator.

Notwithstanding our increased facilities, we find it extremely difficult to furnish indicators as promptly as we wish, and, if present demand continues, we shall be obliged to again increase our capacity.

Robert Wetherill & Co. (Engines, Boilers and Machinery), Chester, Pa., write us:

Our business during 1882 has been very satisfactory, full of orders during the whole year, running the works at night part of the time—about 25 per cent. increase over 1881. We have put in a number of machine tools, including a complete outfit for the manufacture of shafting, pulleys, hangers, etc. We build, on an average, one Corliss steam engine per week, with additional improvements in their general working parts, which cannot be excelled in good workmanship, and are adapted for heavy, continuous work. Our boiler shops have been full of orders during the year.

We are now in a position to supply manufacturing establishments throughout with all their steam power, with shafting complete. We have adopted a system of standard gauges for all parts in connection with our work, and have arranged special tools for the manufacture of different parts, which gives us perfect workmanship, with interchangeable parts to standard gauges. We have put up new buildings, in addition to our foundry department, for castings, cleaning and storage materials.

We have numerous applications for work in our line, and our prospects for 1883 are very good.

Skinner & Wood (Engines and Boilers), Erie, Pa., write us:

We are glad to report a prosperous season for 1882. Up to November 1 the volume of business promised to be very much in excess of previous years, but for the past two months trade has been dull and orders few, cutting down our aggregate and giving us only a fair increase over 1881.

Collections have been fully up to the average, and in many Southern sections better than for years. Few complaints reach us from merchants or planters who have to be carried over, and the purchases for strictly cash among this class of farmers have been numerous, and the fact is encouraging.

Touching the outlook we think it is good, and believe there will be a very fair demand for engines and boilers in '83, of which our share, we trust, will be about 300.

Lowe & Watson (Steam Boilers and Feed Water Heaters), Bridgeport, Conn., write us:

Notwithstanding the destruction of our entire works by fire last April, we have managed to do a larger business this year than last. Through the spring, summer and fall we worked under temporary buildings. We have built entire new works which we have moved into almost without cessation of our business. We are working out of our orders, although nearly a month behind on some, yet we can see the end of them, but more are coming in slowly, which is unusual at this time of year (in our business) when we are generally making up stock, of which we have very little on hand at this time. We are not satisfied with the prices competition makes in our business, because they are and have been lower *pro rata* to stock and labor than ever before during prosperous times in our experience. The reasons for this must be due more to increase of facilities to meet the demand, than to improved means. We also find that we cannot get as much time to do work as formerly, on account of the great rush to get into operation of our patrons, and have been obliged to let several fine orders go this year on this account. Our business in our specialities, which are the Lowe Boiler and Feed Water Heater, has steadily increased, so that we have been unable to get them in stock and obliged to make to order only. There is evidently going to be a lull in the demand, and lower prices, yet we can see where we shall get much necessary work for our establishments for renewals but not for new orders. In conclusion we venture to say that payments generally have been slower than usual, which certainly leads to doubts and fears for the future, while the boom is on the wane.

The American Saw Co. (Saws and Wrenches), Trenton, N. J., write us:

During 1882, up to December 1, our orders have crowded our product on our specialties, viz.: Inserted Tooth Saws and Alligator Wrenches. Our winter trade on saws is largely with the South. Yellow pine having declined in price fron $15.00 to $11.50, the Southern trade is very light, but Western trade will be very large this spring.

Our sales on alligator wrenches in 1882, were 150% greater than 1881. This increase we attribute largely to our advertisement in the AMERICAN MACHINIST.

D. Frisbie & Co. (Friction Pulleys, Hoisters, Couplings, etc.), New Haven, Conn., and Philadelphia, Pa., write us:

We have to say we are very busy at our New Haven shop, are working at our full capacity and are now running until 9 o'clock at night to get off our orders. Our business is improving, our orders are much larger than formerly, work being of a heavier class than has been believed in by engineers heretofore. We have added a small shop to our business in Philadelphia with a view of making a specialty of our friction hoisting engine, for which we have taken out patents this fall. Are about to build a new shop in New Haven this spring of double the capacity we now have. We have added to the cost of our goods by improvements, but have not raised prices. Our outlook for the future is good. We have had a long and expensive road to prove to the public that we can do the heavy work of main powers, but we are now well established and are receiving orders from all parts of the country and some out.

The Betts Machine Co. (Machine Tools, Standard Gauges, etc.), Wilmington, Del., write us:

Business during the year now drawing to a close has been very good, though orders have not been placed so freely during the last three months as they have been for the last two or three years. All departments of our works have been running full, with a full complement of workmen.

Our buildings and machine shop plant have had additions made to them, and we are now better fixed than ever before for handling our business.

The adjustable reamer that we put upon the market in connection with our standard gauges, has proved a great success, and we still feel gratified with the progress we are making in introducing our Standard Gauges throughout this and other countries.

The demand for large tools keeps up well, but there is a disposition on the part of purchasers to look for lower prices. On the whole we think the prospect for the next year looks better than it did two months ago.

E. G. Felthousen (Engine and Boiler Supplies), Buffalo, N. Y., writes us:

I have put in during the last year in my factory eight 16″ swing lathes, three drill presses, and a Brainard gear-cutting device, and have otherwise increased my facilities, so that I am now able to turn out twice as many goods as I could twelve months ago. My patented specialties are meeting with a very large sale, with every prospect of a large increase next year. I have orders now sufficient to keep me busy for four months. I believe my advertising in the AMERICAN MACHINIST has helped me a great deal.

George C. Howard (Machinery), Philadelphia, Pa , writes us:

During the year 1882 we have been fully employed in the manufacture of our special machinery. We added additional buildings and ground to facilitate our work. We endeavor to keep even with any establishment in the quality of our work. Orders have now accumulated so that we are compelled to get the aid of other shops to enable us to complete our orders promptly. Material and labor are now somewhat lower than in January, 1882, and workmen are more steady and industrious. As some establishments are not filled with orders, we expect lower prices will be offered for ordinary machinery.

The Seibert Cylinder Oil-Cup Company, Boston, Mass., write us:

Owing to the successful termination of some of our suits against infringers of our "*Sight Feed*" patents, our business for 1882 has been largely in excess of 1881; and with a vigorous prosecution of the remaining infringers, we have every reason to look forward to a much greater increase in 1883.

We have recently added new machinery and enlarged the capacity of our shops, but at the present time are behind in our orders, having received some large ones for locomotive lubricators.

J. A. Fay & Co. (Wood Working Machinery), Cincinnati, O., write us:

We can say that our business for the past year has been the largest in our history. We have made extensive additions and increased our equipment of tools; in fact, our facilities have been enlarged in every department. Our orders have been unprecedently large from our home trade, while our foreign orders have poured in like an avalanche. There has been no material reduction in the prices of material or labor with us. In fact, we use a higher grade of skilled labor, and probably more of it, than any like shop in the world. We believe to do good work requires good men, and the more accomplished the mechanic the better will be the product that comes from his hands. We are looking forward to the coming year to be a good one. Our volume of trade is very satisfactory.

S. Ashton Hand (Machinists' Tools), Toughkenamon, Pa., writes us:

Business has been generally good with me throughout the current year. I have increased my capacity about 20 per cent. since this time last year, and have no trouble in getting all the skilled labor I want to run the new machinery added.

I have redesigned my 14" engine lathes and made an entirely new set of patterns for them, embodying many improvements. I intend to make this size of lathe an exclusive specialty during the coming year.

I am paying about the same wages as at this time last year, but can buy material at a slightly lower rate.

Joseph B. Matthews (Steam Engines), Baltimore, Md., writes us:

Owing to sickness in my family, I have devoted but little time to business. I have sold but one engine during the year, but general business has been good. I am now having patterns made for a new style of engine, which I hope to be able soon to put on the market, which, in my opinion, will be superior to any now made, in some particulars.

W. H. Craig & Co. (Hydraulic Governors), Lawrence, Mass., write us:

We have enjoyed a steadily increasing business the past year. The call for large governors was much larger than we had expected, causing some delay in many cases.

The prospect for the year 1883 is very bright, and we hope to give our patrons less cause to complain of our keeping them waiting too long before filling their orders.

S. W. Goodyear (Machines for Pointing or Reducing Wire), Waterbury, Conn., writes us:

While the amount of my business is too small to deserve mention in your valuable paper, I am feeling quite encouraged by the inquiries, which, thanks to my advertisement in the AMERICAN MACHINIST, are made almost daily in reference to cold swaging. Have sold five machines since October 1st, at which time I made a reduction in prices.

Dwight Slate (Drills and Special Machinery), Hartford, Conn., writes us:

I have about doubled my shop capacity during the last year. I have sold 115 sensitive drills; 12 grinding machines for cutters, reamers, mills, etc.; 18 marking machines; and many special machines, such as wood screw machinery, automatic gear and rack cutters, screw-slotting machines, one Lay-Haight torpedo, which required the very best of workmanship, and have also taken an order for a large number of electric lamps. I shall not enlarge my shop and facilities in the next year, as I am now fixed so as to do both my regular and special work to good advantage. I thought that trade was "letting up" a little, but the last lot of drills I made (thirty) were sold within a week after they were done. There is a prospect of a good European trade. I have had several orders from Canada, without any preliminary correspondence. They *all* ordered from seeing my advertisement in the AMERICAN MACHINIST. I shall employ from thirty to thirty-five men next year.

L. Katzenstein & Co. (Metallic Packing), 169 Christopher street, New York, write us:

We have to state that our business in the manufacturing of our metallic packing has been good during the whole year; in fact, better than ever before. We had to get a larger shop—had always orders ahead. We opened new agencies for manufacturing our packing in France at Marseilles, and in Italy at Palermo, beside our established branches in Scotland at Glasgow, and in Germany at Kiel, and in Austria at Trieste. This packing is now in general use throughout the world. We furnished the metallic packing this year to most all new steamers built here and in Europe; and the largest steamers afloat in any part of the world, as the City of Rome, Servia, Arizona, Elbe, Weser, and many smaller ones, all built in England and Germany. Here, for the United States, we fitted up the engines, most all, of steamers, tugboats and yachts of all descriptions built by the principal ship and engine builders. Besides many orders for stationary engines of all descriptions and sizes, we added many new customers to our former ones. Bills have been paid quite well, and if we do the coming years as well as this year, we shall be well satisfied.

W. P. Davis (Drills and Key Seating Machines), North Brookfield, N. Y., writes:

Business is very good. I am not as much behind with orders as one year ago this time, but should be had I not added more room and machinery. I have now machines in use in all parts of the United States and Canada, and have made some shipments to France and England, and have every reason to expect a good demand the coming year. One reason I think of holding my trade is, I have always sold my tools very low as compared with most makers, and have always endeavored to give my customers the worth of their money.

W. C. Young & Co. (Lathes and Tools), Worcester, Mass., write us:

As to the year 1882, business has been very satisfactory. We have increased our machinery one half, and added what room we could get, but for all that have been unable to keep up with our orders. Judging from present orders, and the number of inquiries we have for tools, we shall have all we can do for some months to come. In one mail this week we had eleven letters asking for prices, &c., seven of which referred to the AMERICAN MACHINIST, two of these being from foreign countries, and the rest representing five different States.

The American Twist Drill Co. (Emery Wheels, Grinders, &c.), Meredithville, N. H., write us:

We have an active demand from prompt paying customers for all the goods in our line that we can manufacture.

With plenty of orders on hand, the business outlook for the coming year is very encouraging.

Cope & Maxwell Mfg. Co. (Iron and Brass Foundry and manufacturers of all kinds of Steam Pumping Machinery), Hamilton, Ohio, write us:

Our business for the season just closed has been very good indeed, and quite encouraging. Inquiries are being now made for a larger class of machinery than is usually called for this season of the year. Our trade in large and small machines will exceed any previous year since we have been in business. We have, until lately, been running our pattern shop with an extra number of patternmakers until after 9 o'clock at night, getting out patterns for a number of machines for the United States River Commission. We are now working about 100 men on pumping machinery alone. We think prospects for next year's business are very promising.

We contemplate building a large brass foundry in the spring. There has not been any reduction of wages with us as yet. Skilled labor seems more plenty than heretofore, and prices for finished work remain unchanged.

The Hendey Machine Co. (Planers, Shapers, &c.), Torrington, Conn., writes us:

During the current year we have built an addition to our main shop 50×40 feet, and an additional building 20×40 feet. We have taken out our 20 H. P. engine and have put in a 41 H. P. Harris-Corliss engine. We have in use 46 lathes, 26 planers, 5 shapers, 7 upright drills, 2 gear cutters and 4 large milling machines, besides special machinery in considerable variety. Of the planers all are of our own make except three, and four out of five shapers are also of our own make. Our output for 1882 was 120–24" shapers, 110–15" shapers, 72 planers, besides over 100 special tools, including hand lathes, hand planers, planer and shaper centers, &c. As you are aware, we did not go crazy over the boom in the machinery trade, and did not materially advance prices, therefore we are not in position to make any reduction in prices; nor do we think it necessary, for our tools are considered cheap enough and the demand continues satisfactory.

For fifteen months we think we refused more orders than we accepted, but with our increased facilities we expect to be able to meet all demands with reasonable promptness. As soon as we can get about it in the spring, we intend to build a foundry 50×100 feet, with all the modern conveniences for doing the work. We are building a 30" stroke shaper with a 5 foot traverse, for heavy work. We expect to make it the finest heavy tool of its kind on the market.

While we do not anticipate such a headlong scramble for machinery as we have experienced during the past two years, we shall be greatly disappointed if the year 1883 does not bring entirely satisfactory results.

The Lambertville Iron Works (Engines, Boilers, Machinists' Tools, etc.), Lambertville, N. J., write us:

We have completed the enlargement of our works the past year, and have greatly added to our facilities. We now have railroad sidings reaching every part of our works, by means of which we are able to ship our heaviest engines and receive our materials with the least possible expense. The success of our new automatic engine has fully met our most sanguine expectations, and we have every reason to believe that our works will be pushed to their utmost capacity in supplying the demand. Our new illustrated pamphlet of automatic engines is now ready, and will be sent upon application.

J. Birkenhead (Lathes, etc.), Mansfield, Mass., writes us:

I started business about the year sixty-four, and worked gradually into textile spindles and improvements in ring spinning. As my business increased I felt a need of automatic lathes to cheapen the cost of my goods. I invented a reliable stop motion for lathes. Commenced building the same a year ago last summer, aside from my regular business. After a large outlay I put some on the market, and not being known as a builder of lathes, I could make no sales, but at the present writing I am behind my orders. Whether it is owing to advertising in your paper or the improved state of the market, or the liking that has sprung up for my tools, I am unable to state, but I think each is entitled to a share.

The Taylor Manufacturing Co. (Engines and Machinery), Chambersburg, Pa., write us:

Our business for 1882 has been very satisfactory. We worked the entire year on orders, generally $30,000 worth on hand.

Have just removed from Westminster, Md., and are now in our new works with increased facilities for 1883.

We have a large amount of orders for January, February and March delivery, and think we shall double our production this year.

The Stiles & Parker Press Co. (Presses, Dies, Machinists' Tools, etc.), Middletown, Conn., write us:

In the past year we have added to our buildings, and our sales have been much larger than ever before, and our profits double those of any previous year.

We have added to our tools, one planer 60" x50"x12' (making 14 in all), one 36' pulley lathe, a splining machine and shaper, besides many special appliances adapted to facilitate the producing of our presses.

Our orders are flattering, and especially for the current month of December, have been unusually encouraging

We have no assortment of our presses on hand, in fact, our storeroom is almost empty, as our tools have been purchased as fast as we have been able to make them. We shall bring out in the coming year a new line of presses particularly adapted to the requirements of tin-workers, which will contain our improvements patented in 1882, and some new features which promise great utility.

We have in progress, beside our regular work, a special order of 3 perforating presses to perforate sheets 54" wide, 278 holes at one impression, through steel $\frac{1}{16}$" thick, automatic feed, 80 strokes per minute.

Our trade in drop hammers is increasing beyond our expectations. Our drop hammers and presses took the highest award in their class at the recent exhibition at the Fair of the American Institute.

Our prospects were never more encouraging than on this first of January, 1883.

Schutte & Goehring (Engineers and Machinists), Philadelphia, Pa., write us:

We are happy to report our business for the year 1882 quite satisfactory and fully up to our expectations, amounting to more than 60 per cent. increase over 1881. The growing demand for our goods keeps us constantly increasing our facilities, and judging from the large number of machines turned out during the current year, working several months day and night, we can safely estimate on heavy business for the coming year. Our productions consist chiefly of specialties for steam users, viz.: injectors, condensers, furnace blowers, lead and platinum-lined syphons, for raising acids, liquid elevators of brass and iron, gas exhausters, chimney ventilators and blast nozzles for smokestacks, liquid fuel burners, also fire engines and other special steam jet apparatus, sectional high-pressure boilers, etc. We are also largely engaged in building hydraulic machinery for all purposes, such as hoists, cranes, car-wheel transfers, etc., for use in railroad shops and other large works. Our prospects of orders for this class of machinery, for the coming year, independent of our standard specialties of manufacture, are quite large, and will more than likely greatly exceed our expectations.

We have experienced but slight changes in the cost of material this year, but find that compensation for skilled labor is steadily advancing, while the prices for productions remain unchanged.

We at present employ nearly 100 hands, and as our facilities for filling orders are growing less adequate every year, to meet the demand for our goods, we will shortly have to extend our works and increase our capacity accordingly.

Schleicher, Schumm & Co. (Otto Gas Engines), Philadelphia, Pa., write us:

We can report for the past year an increase in our business of seventy per cent., and have added to our capacity accordingly. Orders on hand at present will cover production of over a month to come. The demand continues a steady one.

Woodbury, Booth & Pryor (Steam Engines), Rochester, N. Y., write us:

Our trade for 1882 has been satisfactory, and, judging from inquiries made for prices of engines and boilers that parties state they contemplate putting in next season, 1883 will be just as good. We have more orders in hand now than we had last year at this time.

Poole & Hunt (Founders and Machinists), Baltimore, Md., write us:

We have largely increased our facilities during the year 1882, and have been fully employed. We are still busy, but have no heavy orders on hand.

As to the prospects for business during the coming year, we do not pretend to know much; but, being very decidedly of the opinion that this country is not yet finished, we have no doubt that somebody will have something to do.

J. M. Carpenter, Pawtucket, R. I. (Taps and Dies), writes:

Have moved into a new shop where there is room for a large increase of capacity when needed. Have done 30 per cent. more business in 1882 than in 1881. Prospects for 1883 look fair and healthy.

Lodge Barker, & Co. (Lathes and Tools), Cincinnati, O., write us:

Our business has been progressing most favorably for the twelve months last passed. We have increased our capacity since last January about one-half, and have directed our attention largely to perfecting our system of gauges and special tools. Have also added to our line of product the following new tools: A 16"×6 foot Fox monitor, with chasing bar, dovetail set over, swivel, lever and screw, and patent device for throwing in the gear while the lathe is in motion, an improved valve milling machine with novel devices for clamping valves securely and for quick adjustability, an improved hand Fox lathe, and a new slide rest with some new features on it. We intend shortly to issue a new catalogue. We are full of business, and are quite satisfied with the prospects for the coming year. We think there is some tendency towards lower prices for machinery. Labor is more plentiful, and we find by reference to our books a lower average in wages by about 10 per cent. than last year.

Hilles & Jones (Machinists' and Boiler Makers' Tools), Wilmington, Del., write us:

Our business during 1882 has been very satisfactory in every way throughout the year. Being manufacturers of special tools for locomotive builders, boiler shops and iron shipyards, we have been kept constantly busy with our full force. We have increased our facilities and production during the year very much by having a railroad switch come directly into our works, and 185 feet new wharf front on the river, and by disposing of several old tools and adding new ones especially adapted to our business, we have every prospect of a good business during 1883.

The E. Horton & Son Co. (Lathe Chucks), Windsor Locks, Conn., write us:

During the year 1882 we have increased our facilities for doing work, having added much new and improved machinery, and employed a larger force of workmen than ever before. We are having all the business we can well attend to now, and the outlook is good for the coming year. We have added to our list several styles and sizes of chucks not made before. We have also built an addition to our shop, to be occupied for an office, which was necessary on account of the large increase of business that we have been favored with. Our speciality is "The Horton Lathe Chuck."

(*We have received several more letters from manufacturers, which for want of space we are unable to present this week. They will appear in our next issue.*)

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☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JAN. 20, 1883.

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Machinery Prospects for 1883.

We present this week letters from over forty establishments engaged in manufacturing machinery, engines, boilers, tools and machinists' supplies, representing several States, which have been written in answer to our special annual inquiry as to condition of business, progress during the past year, and prospects for the year before us. It will be noticed upon a general perusal of them all that 1882 has been a signally prosperous year, and that confidence in trade for the present year is not lacking. Taken as a whole, however, prices of machinery and tools are lower than they were last January, and the tendency is towards closer competition. Shops have enlarged their capacities to such an extent that even should the demand during 1883 prove equal to what it was during 1882 (which at this writing seems unlikely) customers generally will not have to wait any extra length of time to get their orders filled.

Iron and other materials that enter into machine construction are lower than in January, 1882, but as a rule wages of first-class mechanics have not declined. Perhaps it is wise to anticipate somewhat longer credits than have ruled for the past year or two, but there is a general agreement that business is in a healthy condition. One feature of interest in the letters we publish, is the fact that several manufacturers are having a foreign trade for their machinery as well as a good home demand. Most establishments have been giving a share of their attention to new specialities or to improvements in old ones. The business is eminently progressive, and, with no overcrowding of orders, we may look for still greater improvements in the products of machine shops this year.

Mechanical Modesty.

A great deal of valuable information is withheld through a disinclination to state plain facts on the part of those who consider it their province to accomplish results rather than to tell of their accomplishment. As a rule, mechanics when it comes to a question of telling (for the benefit of others) what they know—exactly—are found to be blessed with considerable of the quality of modesty; if not too much for their own good, at least too much for the general good. Advances have been made in this respect, and as a result of reading and studying more, the mechanic is more frequently found asserting himself, but he still does so quite too seldom. He is yet too apt to contrast his own education, which consists of what he *knows*, with that of another, which is mainly included in what he *thinks*, and strangely enough in a way unfavorable to himself. It is hard, apparently, for him to get away from the bugbear of lack of education on his part, and to comprehend that he is really well educated on the subject at issue. Plain facts are all the more acceptable for being told in a plain way, and facts are what are wanted. Unquestionably there is growing up a literature of mechanics and workers, of the utmost importance to future development, but like most other good things there is room for it to grow faster.

There is never any lack of those who are anxious to give the world the benefit of their knowledge of things they know nothing about, except by hearsay. Unfortunately modesty is inoperative to restrain them, and in about the same degree that it is operative to restrain those who could speak from the authority of what they know. There is sufficient difference between fact and hypothesis to make the latter of little consequence when applied to mechanical matters, yet it as easy to get more than an abundance of the latter as to get a limited supply of the former.

We recently published a communication relating to foundry practice, which was written in response to a request for specific information. In this communication the exact information asked for was given in a plain and concise manner, and in such a way as to leave no doubt as to the writer having performed the operation which he explained, as well of his ability to tell others how to do so. In other words, the information conveyed represented exact knowledge in the direct line of the inquiry, and hence was doubly valuable. The name of the writer was withheld at his request, the reason given being that he was "only a moulder." Had the reason been that he was only a lawyer, or a doctor, or a mathematician—in fact, anything but just what he was, viz., one educated by a good many years' hard study in a direction to fit him to impart the desired information—the reason would have been a forcible one. As it was, it suggested too much modesty on the part of the writer, as well as the probability that in his case, and in others, modesty generally goes further than this, and withholds the communication as well as the name. Of course, this reasoning does not refer to the request that the writer be not personally known in the matter (since various circumstances may influence one against a willingness to write for publication over his own proper signature, but to the reason given. Were the instance cited in any sense exceptional, it could not be accepted as evidence; but, on the contrary, it is so common as to force the conclusion that modesty interferes too much in such matters. Why a mechanic should assume that an apology is necessary when he furnishes information that cannot be furnished by any one but a mechanic, is not so plain as it is often true.

What we learn of mechanical matters must somehow be learned from the mechanic, and what is wanted to advance the general knowledge is not accounts of great *strides*—these will take care of themselves if they are ever made—but of the thousand *steps* of as many individuals, which, put together, cover a good deal of distance. Exact knowledge of mechanical manipulation is the result of experiment and experience, and when one gives others the assistance of his experience in specific directions, he is a public benefactor, and at the same time generally benefits himself.

Elements in Fixing Passenger Rates.

Among our "Letters from Practical Men" this week we publish one from a Boston correspondent, relating to "Limiting Passenger Rates." The writer, who informs us that he has been employed in the general offices of some of the largest roads in Kansas, believes himself able to speak advisedly, and points out reasons why Western railroads find a three-cent tariff unprofitable. The theory upon which many railroad companies fix their passenger rates seems to be that those who pay their fare, when they travel by rail, should be obliged by State laws to submit to a rate above and beyond that required by an equitable cash-in-hand passenger service, in order to make up losses incurred by carrying free a host of officials, such as members of Congress, members of the Legislature, State and local officials, judges of the courts, and a certain class of newspaper men. These individuals are willing to accept such petty bribes as free passes, supposed to be in consideration for looking out for the interests of the railroad companies in their several capacities. "In many cases," says our correspondent, "the pass is also extended to the family of the holder, which reduces the paying class to a comparatively small number." If this system continues to progress at the same rate as it has for five years past, so as to include among the deadheads not only legislators, State officials and newspaper attachés, but their sisters, their cousins and their aunts, the three-cent rate of fare for paying passengers will not cover the losses; in short, the innocent public, who support the railroads, will be asked to submit to a four or five cent rate of fare. There is no open, legitimate reason that would stand the scrutiny of public review, applied to each individual practising this plan, why officials of the Government or newspapers should receive free passes over any railroad in the country.

Independent public officials and independent newspapers will not only refuse to ask for but refuse to accept these petty bribes when proffered. To ask for laws compelling innocent travelers who pay their fare over railroads to pay extra high rates so as to make up the expenses of bribery, is a brazen effrontery that cannot be characterized with too strong disapproval. If railroad companies who really wish to rid themselves of the deadhead system (and the railroad journals claim that they all so desire) will give to the newspapers for publication the name and position of every individual asking for and receiving a free pass, they could rid themselves of the evil in a short time. They need not fear the enmity of office-holders or the press, for the most intelligent and powerful portion of the public (which makes and unmakes office-holders) will sustain them, and we are not among those who believe that the American newspaper press, as a whole, is corrupt.

In his first message, the new Governor of the State of New York, Grover Cleveland, foreshadows his policy in regard to prison labor competition, which, under the contract system, has forced down the price of free labor in some trades, and seriously threatened several others. He refers to the overcrowding of one prison (where the workshop facilities are greatest and contracts most profitable), and says:

On the 30th day of last September the number of convicts confined in Sing Sing Prison was 1,526, while Auburn contained but 912, and Clinton 499. If these penal institutions are self-sustaining, without injury or embarrassment to honest labor, it is a matter for congratulation; but it is, at least, very questionable whether the State should go further and seek to realize a profit from its convict labor. In my judgment, it should not, especially if the danger of competition between convicts and those who honestly toil is thereby increased, and the overcrowding of any of the prisons, with its attendant evils, is the result.

A correspondent asks us to tell him the number of feet of shafting, 1½" to 3", that can be turned per day in the best special shafting lathes. We shall be glad to hear, for the benefit of our correspondent, from the men who are acquainted with the performance of such tools, of their capacity.

The Co-Operative Principle.

The failure of the Co-operative Dress Association of New York has given rise to many unfavorable comments by the daily papers upon co-operation as an industrial principle. In one or two leading dailies it is asserted as fact needing no proof that all co-operative ventures in this country have been failures. The truth is, there are many flourishing co-operative manufacturing establishments in the United States. One of them is the largest manufactory of wood-working machinery in the world, selling its products to every civilized country. Quite a number of co-operative stove foundries, both East and West, are running successfully, one (in Troy, N. Y.) having been in operation about fifteen years, and steadily increasing during the whole period. Co-operative furniture manufactories are also running, both East, West and South, with excellent success. Hardware and cutlery, boots and shoes, and a variety of miscellaneous goods, are now being made in co-operative establishments in different States of the Union. The mistake of daily newspaper writers seems to be a confounding of co-operative stores with co-operative manufacturing concerns. The former depend upon tying their shareholders down to a steady and exclusive patronage, upon the supposition that each one is getting the entire dealer's profit upon the goods he purchases. So far as we can learn, co-operative stores have seldom, if ever, been successful on this side of the Atlantic. The shareholders soon refuse to sacrifice their independence in purchasing anywhere they choose, and the outside public (who cannot expect dividends on purchases) naturally conclude they can buy to better advantage elsewhere. The plan of a co-operative manufacturing establishment

is very different. The shareholders are each employed in the business at regular wages. No one is expected to buy their products by reason of the co-operative organization. They compete with other manufacturers in the open market, and the same elements of ability in management, advantageous location and proper resources will produce the same success as firms or stock companies enjoy in the same line of business. The advantages to the shareholders are that they are insured employment while the shops are running, and are enabled to participate in the profits of the concern. A co-operative manufactory can stand bad management no better than any other enterprise. About the same proportion of them fail as other productive establishments, and from like causes.

In our issue of December 16, 1882, we stated that *Mechanical Engineering* had appropriated from the columns of the AMERICAN MACHINIST an article without the explanatory engravings, and also the engravings belonging to another article, without the usual formality of giving credit. This statement was made on the authority of the October number of the journal referred to, and in which the article and illustration appeared. Since then we have received from the publishers a leaf from the August number, on which it is stated that a plate borrowed from the AMERICAN MACHINIST would appear in October. We are quite willing to give our contemporary all the benefit this previous system of credit entitles it to; but, as a matter of curiosity, are yet trying to find not only the credit, but the engravings which should have accompanied the other article, appropriated under a new title.

The Secretary of the American Institute of Mining Engineers announces by circular that the annual meeting of that society will be held in Boston, beginning Tuesday, Feb. 20th. A subsequent notice will give the detailed programme of the meeting. This is the largest society of engineers in the United States, and the membership is constantly increasing.

We are daily in receipt of a large number of letters from admiring readers of the AMERICAN MACHINIST, who express themselves in the most glowing terms in regard to its excellence. Modesty forbids our publishing them, but we must express in this general way our thanks and gratification for these encouraging expressions. They are all fully appreciated. The number of subscriptions now being received every day for the AMERICAN MACHINIST is greater than at any other period since its establishment.

A railroad freight case has recently been decided in the English court of last resort, which, as the *Ironmonger* says, "goes to prove that whether goods are carried at owner's or company's risk, the companies are equally liable for damage, loss, or delay."

Literary Notes.

Report of the Sixteenth Annual Convention of the Master Car Builders' Association, held in the City of Philadelphia, June 13th, 14th and 15th, 1882. Printed under the direction of the Association, 113 Liberty street, New York.

A consideration of the accidents to train men occupies a prominent place in the reports of committees, and is a subject that has been treated in a very fair manner by the Master Car Builders. The subject of dead blocks and draw heads with appurtenances has also been thoroughly discussed. The committee on carrying capacity of freight cars in their report recommend the building of cars to carry thirty tons, possessing the following advantages: Less cost of repairs as well as a reduced first cost; less dead weight; less number of way bills to make, as well as shorter trains and shorter side tracks; less wear and tear of draw bars and fixtures; a reduced number of brakes and fewer journals to lubricate. Such cars would have fewer wheels to inspect, and would require smaller crews to run trains composed of cars to carry 30 tons,

In fact the principal part of the book is made up of numerous practical discussions of a highly interesting character to persons interested in railroad matters. One of the most commendable steps that the Master Car Builders' Association have ever taken is the adoption of a standard system of gauges (The Pratt & Whitney Co.'s make) by which to order all screws and bolts for car work. These directions are fully described in the proceedings of 1882.

HOUSE DRAINAGE AND SANITARY PLUMBING. By Wm. Paul Gerhard, C. E. Reprinted from *Van Nostrand's Magazine*, Published by D. Van Nostrand, New York. Price, 50 cts., boards.

This little book comprises No. 63 of Van Nostrand's Science Series. The essay which comprises this work was originally prepared for the annual report of the State Board of Health of Rhode Island, and met with a favorable reception after its first presentation to the public. It has been well appreciated both by theoretical as well as practical men. Plumbing apparatus is described, with suggestions for its proper arrangement. Illustrations are also given of good and bad plumbing. The best method of laying out drains and soil pipes both inside and outside of buildings is explained. In addition to this plans are described for ventilation of traps and drains, cistern overflows, refrigerator overflows, safe wastes, drainage of cellars, dampness of walls, house drainage, laundry and kitchen fixtures, besides numerous other devices and details which would necessarily be classified under the head of plumbing.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(21) E. J. K., New York, asks: How can I make application for admission to the Cooper Institute? *A.*—In the office in the building.

(22) T. S. Lyman, Warren, Mass., asks: What metal expands and contracts the most by heat and cold? *A.*—Of well known metals, zinc.

(23) N. L. C., Providence, R. I., asks: Do you know of any one employing from 1500 to 2000 men in a building having several entrances, who has in operation a practical system of keeping time by checks, that is, every person keeping his own time? *A.*—We do not know of such an establishment. If any of our readers know of such, we trust they will give N. L. C. the benefit of their experience.

(24) B. M., Springfield, Mass., asks: 1. Is it right to carry 187 lbs. of steam on a boiler that is tested at 150 lbs. water test? *A.*—Not if the water test is in any sense for determining the safety of the boiler. It is customary to test with water pressure to not less than 50 per cent. higher than the steam pressure to be carried. 2. Is it right to test a boiler with steam to determine if it is safe? *A.*—No.

(25) W. H., Cleveland, Ohio, writes: We have a boiler 42" diameter, ¼" shell, C. H. No. 1 iron double riveted. The tensile strength, as stamped on each sheet, is 50,000 lbs. The heads are ⅛" best flange iron. 1. What will be a safe working pressure for this boiler? *A.*—Under United States inspection laws, a boiler of these dimensions and quality of iron, laps double riveted and holes drilled, would pass for a pressure of 119 lbs. This supposes the boiler to be subject to rigid inspection, and in ordinary practice we should not recommend carrying more than 75 to 80 lbs. on such a boiler. 2. Would you consider such a boiler safe under a pressure of 150 lbs.? *A.*—No, not if you mean it to be worked constantly at that pressure.

(26) W. H. G., Park City, Utah, writes: We have a steam receiver, which for all purposes is the same as a steam drum on a boiler. When it was first set up it leaked a little, but after a few days it ceased leaking and we had it covered with asbestos. This did not dry, and finally got to sweating all over. I injected a quantity of oatmeal, which improved it for a short time. I pulled some of the asbestos off, and found the shell leaking in a number of places where it had not leaked before it was covered. I think we shall have to take the covering off and set a boiler maker at work to make the shell tight. Will oatmeal do any permanent good, and what is the best plan to pursue? *A.*—Boiler work should be made quite tight before being covered. Your suggestion of giving the boiler maker a job is right. Do not depend upon getting it tight by the introduction of oatmeal, or any foreign substance whatever. A slight leak under the covering will serve to destroy it. Remove the covering, have the shell made tight, and use it without covering for a week, or until you are sure there are no leaks, then cover it. The covering will not induce leaks, as you suggest.

(27) F. R. P., Mechanicsburg, Ohio, writes: We have thousands of grey iron nuts to make, and experience no little difficulty in turning the faces true with the thread. The nuts are 1⅛" diameter (round), ⅝" thick, tapped to 9-16". Our practice has been to use an arbor, facing one side of the nut and then turning the nut and facing the other side, but when done they do not run true, notwithstanding they fit the arbor tightly. Can you, or any of your readers, suggest a remedy? *A.*—It is not particularly difficult to devise ways for squaring a limited number of nuts true, but when it comes to thousands it is something that is very rarely accomplished. If the nut screws to a shoulder, unless it fits the mandrel extremely nice, the rough surface will throw it out of truth; if the squaring up is done on a mandrel on the centers, the wear of the centers may throw it out of truth, and in any event the wear of the thread from screwing the nuts off and on will, in time, make the fit loose. If squared on a mandrel turned on the end of a center, the wear will affect it in the same way. If the thread of the nut is not cleared out perfectly it will affect the truth of the squaring up. Nut arbors are sometimes made so as to be expanded to fill the nut, but it is doubtful if they are a success. A plan sometimes adopted where great accuracy is required is to make the mandrel a slight taper, and screw the nut tight without screwing to a shoulder, but this is not a quick process. We know of no better plan than making the arbor tapering, and frequently testing the work to see if it is being done satisfactorily.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

C. M. Morse, Mech. Engineer, 95 Liberty St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Mechanical Engineer. Complete motive power outfits a specialty. Peter Banta, Cold Spring, N. Y.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

J. C. Hoadley, Engineer and Expert, 28 State St., Room 28, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Lyman's Gear Chart. How to lay out gear teeth, 50 cts. E. Lyman, C. E. New Haven, Conn.

A handsome monthly journal sent free to engineers and mechanics the year round. Send postal for it to Money Saver, 95 Liberty street, New York.

Steel Forgings, either plain or crank, up to 10,000 lbs. in weight. Address, Pennsylvania Steel Co., 160 Broadway, New York.

Five 18" (6 x 8 foot bed) first-class Engine Lathes ready for delivery. J. A. Fuller & Co., Worcester, Mass.

Light and fine interchangeable machinery to order. Foot and power lathes, slide rests, &c. Catalogue for stamp. Edwd. O. Chase, Newark, N.J.

One hand bookbinder's embossing press for sale. Size of platen, 16" x 24". In first-class order. Ohl & Co., E. Newark, N. J.

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

New Year's Present—"The Complete Practical Machinist," by Joshua Rose, 440 pp. 196 illustrations. $2.50 postpaid. Address, P. O. Box, 3,306 N. Y. City.

Boring Bars made all sizes for all purposes to bore both straight and taper work. Pedrick & Ayer, proprietors, L. B. Flanders' Machine Works, 1025 Hamilton street, Philadelphia, Pa.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on application. E. E. Roberts, 107 Liberty St., New York City.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England. Mailed on receipt of P.O.O. value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

MANUFACTURES

The Baldwin Locomotive Works are building engines for old contracts at the rate of 11 a week.

The Cleveland Malleable Iron Co. now employ over 400 men. A branch house has lately been started in Indianapolis.

Hampsher, Hely & Co., St. Louis, Mo., have purchased the Polytechnic Foundry, at No. 601 South Sixth street, of E. D. Force.

The Lancaster Mills, Clinton, Mass., have given notice of a reduction of wages, averaging about 3 per cent. in all departments, to take effect Jan. 1.

The 400,000 spindles of Lewiston, Me., are running on full time, the severe drouth having not as yet seriously affected the water supply.

The A. C. & I. Railroad Machine Shops at Ashland, Ky., are enlarging and making great improvements. The company has put in new shafting, new couplings, and new engine.

The Eau Claire Chilled Plow Co., a new enterprize in Eau Claire, Wis., have erected new works and hope to be able to start up about the 10th of January, 1883, with a force of about 75 men.

C. L. Jeffords, Jamestown, N. Y., manufacturer of axes, has in hand an order for the Australian market of five hundred dozen axes; they are all to be handled.

Work on the Milwaukee, Lake Shore & Western Railroad Company's machine shops at the new village of Ledyard, on the lower Fox River, Wis., is being pushed as fast as practicable. The company has expended during the present year about $100,000 on these buildings, and the work is far from being completed. It is thought an outlay of $80,000 or $90,000 will complete the works.

The St. Louis, Mo., Vise and Tool Company have erected a new machine shop, their former one having been destroyed by fire last October. The dimensions of the new building are 45x124 feet.

J. F. Blair & Co., of Camden, N. J., manufacturers of planers and other special iron-working machinery, have increased the capacity of their works considerably during the past year, and are now contemplating further improvements.

Extensive iron works to be established at Victoria, B. C., are spoken of, in anticipation of the market to be opened down the line of the Canadian Pacific Railroad. The capital proposed is $100,000.

There is no sewing machine factory in the South and a writer in the *Sewing Machine News* suggests that it would be a good enterprise to establish one at Atlanta. The nearest competitor would be at Cincinnati.

The Novelty Iron and Hardware works, Reading, Pa., have been purchased by New York parties, and will be considerably enlarged by the erection of new buildings. When alterations are completed, 150 men will be employed.

William Perry, of Brockton, Mass., has in course of erection a new iron foundry, which he expects to have ready for occupancy the latter part of January. The building will be 130x50 feet in plan, with an extension 48x130 feet.

The Mathiessen & Hegeler Zinc Company, of La Salle, Ill., are preparing for an enlargement of their entire works. They are now building a large furnace for the smelting of ore for making spelter, and are enlarging their sulphuric acid works.

The Dickson Mfg. Co., Scranton, Pa., are building a shop 200x150 feet. A 25-ton traveling crane will run the whole length of the shop. They build locomotives and machinery, and have prospects of abundent orders.

The Monongahela Mfg. Co., Monongahela City, Pa., has been reorganized with a capital of $20,000. The capacity of the works has been enlarged. General mining supplies constitute the product. T. H. Pollock is Manager, and Wm. H. Morrison Secretary and Treasurer.

W. B. Dunning, of the New York Central Iron Works, Geneva, N. Y., has been re-elected Superintendent, Secretary and Treasurer of the Seneca Lake Steam Navigation Company. This company runs large passenger steamers the year round from Watkins to Geneva.

The East Tennessee Valley Zinc Co., organized a few weeks ago with $300,000 capital, have let contracts for the erection of furnaces and buildings in Knoxville. They have several thousand tons of ore already mined. The furnaces are expected to be in operation next spring.

Herbert Hackney resigns his position as superintendent of the Calumet Iron and Steel Company, at Cummings, Ill., Jan. 1883, to take charge of the erection of the new iron and steel plant of the Northern Pacific Railroad at Portland, Oregon, at a salary of $12,000 a year.

The new works of the American Wire Co., Cleveland, O., will be in operation in March next. It is stated that should the enterprise prove successful a rod mill will be added, and the works extended to a size that will rival the largest of the kind in this country.

Detrick & Harvey, Baltimore, Md., succeed J. S. Detrick, in the manufacture of single post iron planers and other machinery. They have just constructed and sold to the Wells Whip Co, of Wellsville, York Co., Pa., a machine for turning whips. They are also manufacturing a patented machine for peeling and stoning peaches, and one for seeding cherries, both for packers' use.

A new furnace has been tried at the rolling mill of Sheldon & Co., Auburn, N. Y. The *News and Bulletin* of that city says: "The burner looks exceedingly simple. A barrel of coal oil is placed on a stand close by the furnace. A pipe connects it with the burner. The steam is fed by another pipe from the boiler, and upon the meeting of both elements a perfect combustion is obtained, filling the furnace with a white flame such as no other fire can possibly generate, and a heat that can hardly be imagined. An equal heat permeates the entire furnace, 6x12 feet, and the metal is soon reduced to a molten mass."

Straw lumber is soon to be tested in Chicago. In a building now going up it is proposed to use nearly a million feet of this latest product of science. The floors, ceilings, counters and doors of the building are to be made of straw lumber.

The Crozer Iron Works, the new industrial plant at Roanoke, Virginia, are rapidly approaching completion. In addition to the works, about sixty houses have been erected under the superintendence of Isaac Worrall of Media, Pa.

Mr. Ward, proprietor of the Ward Axle Brake Works of Monongahela City, Pa., has constructed an improved cupola, which seems to be exciting a good deal of interest among furnace men. A recent blast was turned on the cupola at 3.48, metal began to flow at 3.55, at 3.56 the tap was closed, and pouring began at 4.02.—*Railway Age.*

John Roach & Sons, ship builders, Chester, Pa., have closed a contract for the building of five iron sailing ships for an American corporation, of which William H. Starbuck, of the Oregon Steam Navigation Company, and Mr. Roach are stockholders. The vessels are to be from 1200 to 1600 tons capacity and are to be ship rigged with three masts. The keel of the first vessel is now being laid, and the others will be begun in quick succession, so as to have them ready for service in May. They will run from New York to any part of the globe.

James Hoover & Sons, the largest iron manufacturers in Norristown, who gave employment to about 250 hands, reduced the wages of their puddlers from $4.50 to $4.25, and the wages of their other employes by from 5 to 6 per cent. They assign as a reason the low market prices of manufactured iron. J. H. Boone & Co., and all the iron manufacturers in Conshohocken have also reduced the wages of their employes by about 5 per per cent. Orders are said, by the firms, to come in slowly, but no necessity appears at present to stop their works from running on full time. The employes are not disposed to grumble, for they know as soon as the prices of iron advance their wages will be increased accordingly. The Standard Iron Company shut down about three weeks ago, throwing about 100 hands out of employment, but it is reported that operations will be resumed before long.—*Reading (Pa.) Eagle.*

The Paterson Silk Industry Association has been earnestly discussing the proposed changes in the silk tariff, and a committee of members of this body, and of the Silk Association of America, have held two conferences with the Senate Committee on Finance in reference to the matter; the last one on Wednesday of this week, after a long consultation at the Hotel Brunswick, in New York, on Tuesday night. It has been agreed to ask that the duty be made not less than fifty per cent. *ad valorem* on imports of manufactured goods, and that a different method of collection be employed, to prevent undervaluations and other frauds. It is suggested that the value be placed on the goods where the duty is paid, instead of taking the market value where manufactured; and it is held that if the tariff law is rigidly enforced, in this regard, fifty per cent. will afford as much protection as the domestic industry has had under the present tariff of sixty; and the manufacturers are not afraid to have the reduction made on those conditions.—*Dry Goods Bulletin.*

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 4, 1883.

As the new year opens the market for supplies presents a quiet appearance with a fair amount of business being transacted. Many of the dealers and manufacturers are yet busily engaged in taking an account of stock, making necessary repairs and in carefully comparing their assets and liabilities to see upon which side of the line they stand. There is a very hopeful feeling existing in regard to future business prosperity. Prices tend to favor the buyer.

Detrick & Harvey, Baltimore, Md., have taken in connection with their other specialties, the sole agency for the Otto Gas Engine in the State of Maryland.

Coes' Genuine Screw Wrenches are now sold at 50 per cent. discount from list, and Coes' Mechanics Wrenches 10 per cent. less.

S. W. Card & Co., Mansfield, Mass., have just issued a new catalogue containing engravings of the taps, dies and other similar specialties made by them. One of the most valuable features in this catalogue is a table giving the diameters of drills for tapping full threads in holes. The sizes given in the table range from a ¼ inch tap up to 2 inches, with correct diameters both for the ordinary V thread and for the U. S. Standard. Tables giving the minute sizes of taps and screw plates are furnished with prices annexed.

Iron and Metal Review.

It is too early in the year to expect much of any change in the Pig Iron market, hence the condition of business in this line remains about the same as last reported.

Consumers manifest no disposition to buy, except for immediate use. The market continues quiet though steady.

We quote Foundry No. 1, $25 to $26. Foundry, No. 2, X, $23 to $23.50. Grey Forge, $19 to $20. The demand for Foreign Iron continues small with prices low and irregular.

We quote Coltness at $26; Glengarnock, $22 to $23; Gartsherrie, $25 to $25.50; Summerlee, $25.50 to $26; Carnbroe, $22; Eglinton, $21 to $21.50; Langloan, $25.50 to $26.

Wrought Iron Scrap is more firm, and is quoted at $27, prime selected from yard. The market for Steel Rails is brightening, and there are prospects of an increase of business in the near future. Manufactured Iron unchanged.

Copper continues dull at 17¾c. to 18c; Banca Tin 28c; Straits, Malaca and Australian 21c. to 21¼c.; Billiton. 21⅛c.; English Lamb and Flag, 22c.; Spelter, Common Domestic, 4.75c. to 5c.; Refined, 8c. to 8¾c.; Silesian, 5c. to 5¼; Lead, 4¾c.; Antimony, Hallett's, 10¼c. to 10⅝c.; Cookson's, 11¼c. to 11⅝c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

A mechanical draughtsman of good technical education and experience desires a situation. Address, Draughtsman, P. O. D. 38, New Haven, Ct.

Wanted—situation as pattern-maker, city or vicinity. Small hardwood patterns preferred. Address, Pattern-maker, Box 379, So. Norwalk, Ct.

A theoretically and practically educated machine draughtsman and constructor (Swiss) desires an engagement. Address, A. S., 119 Washington street, Hoboken, N. J.

Wanted—A first-class Mechanical Draughtsman, who has ability to design Modern Machinery and Tools. Steady employment given if found satisfactory. Address Maryland, care AMERICAN MACHINIST.

A mechanical draughtsman, with first-class references is desirous of securing position where he can have surveying as well as indoor work. Verbatim copies of references shown. Salary secondary object. Address D., BOX 1, care AMERICAN MACHINIST.

Wanted—A good piece work clerk and timekeeper in a large machine tool works in Philadelphia. None but those with experience need apply. Address, with references, "Piece Work," office AMERICAN MACHINIST.

Wanted—A mechanical engineer of practical experience an accustomed to selling machinery to take charged of a valuable agency in Boston. Name references, experience, present occupation and age. Address Boston, care AMERICAN MACHINIST.

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Wanted—Party representing some house and selling Local and General Machinery, Trade Mills, Factories and Machine Shops, to take agency of a new, fast selling specialty on commission. Must furnish good references. State trade solicited. Address O. C., care of Lord & Thomas, Chicago, Ill.

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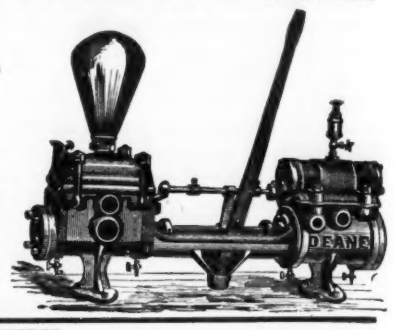

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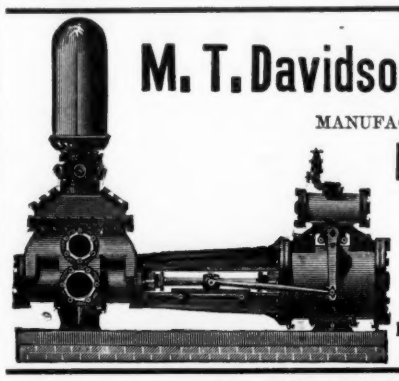

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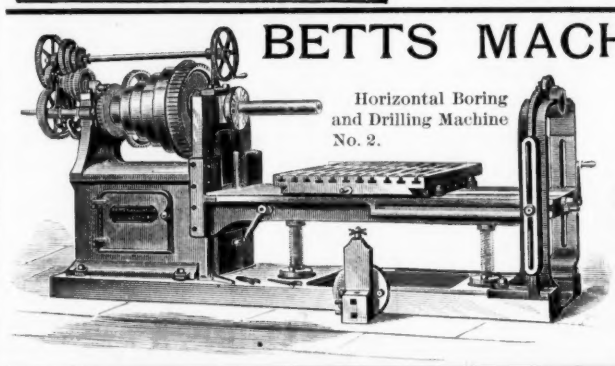

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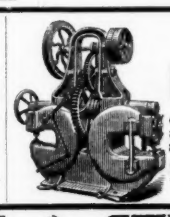

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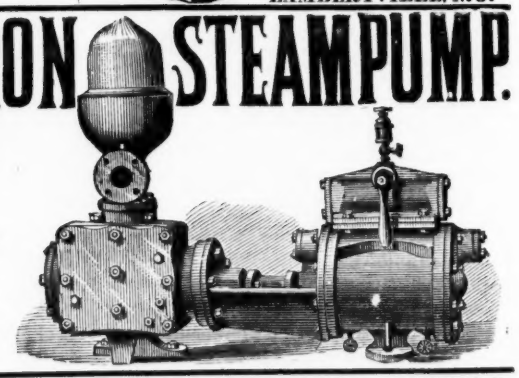

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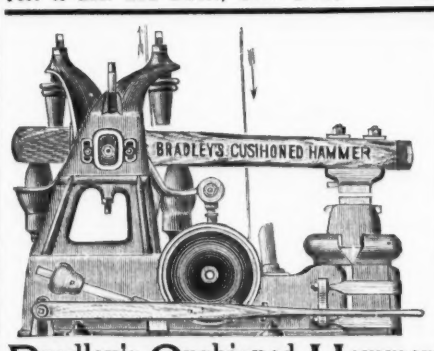

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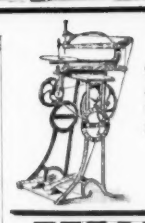

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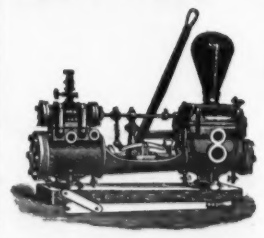

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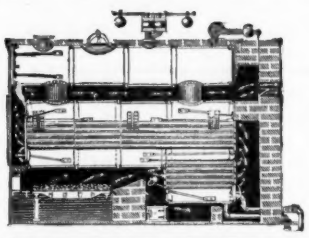

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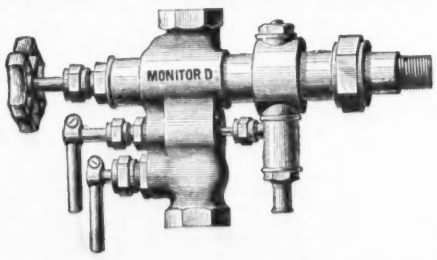

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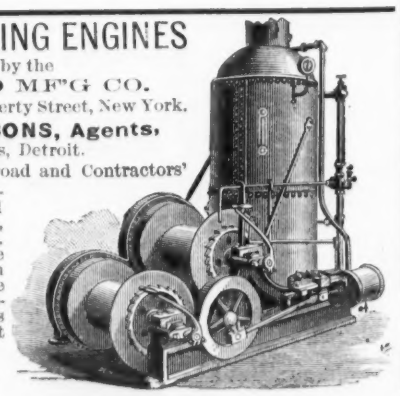

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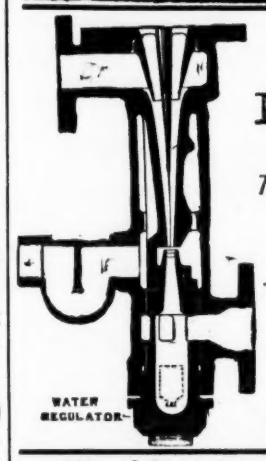

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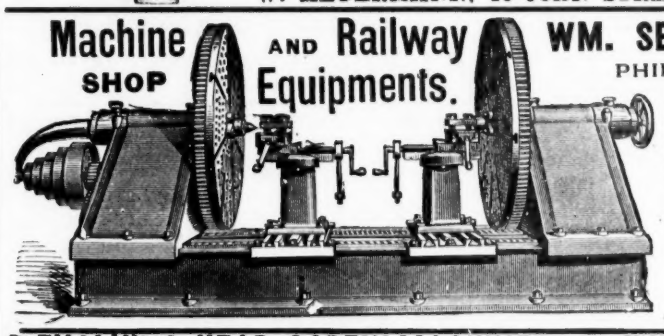

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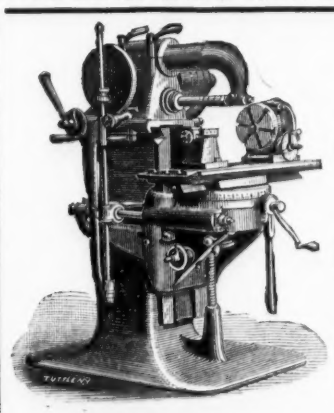

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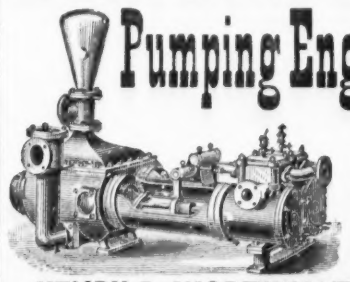

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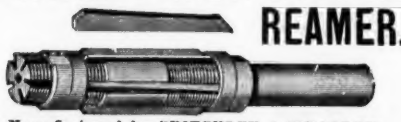

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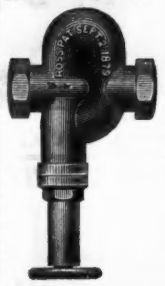

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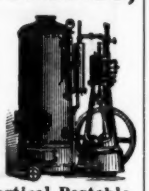

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ELECTRIC LIGHT APPARATUS,
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CAR WHEEL CHUCKS FROM 30 TO 42 INCH.

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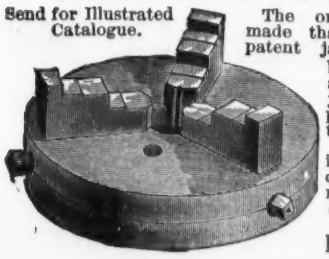

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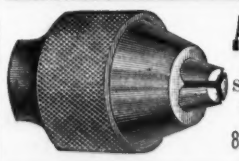

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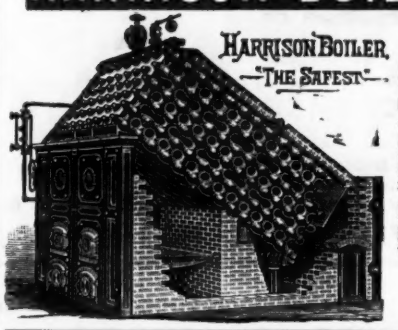

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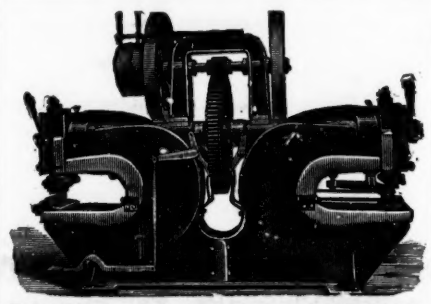

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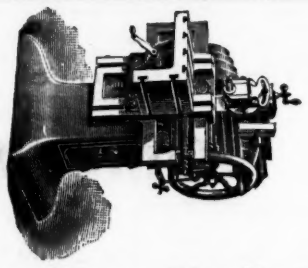

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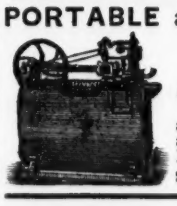

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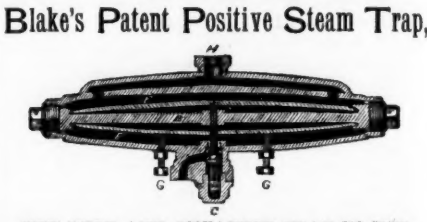

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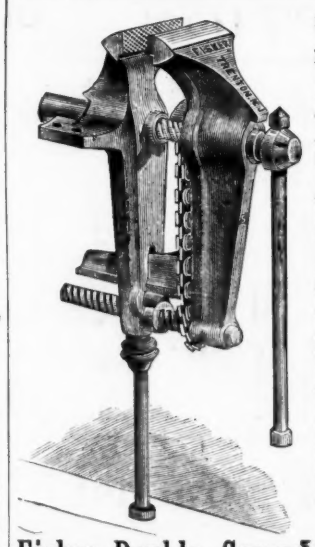

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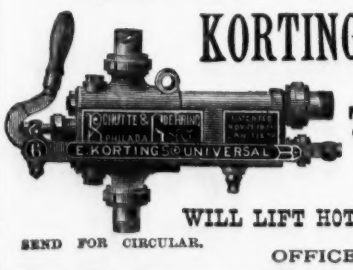

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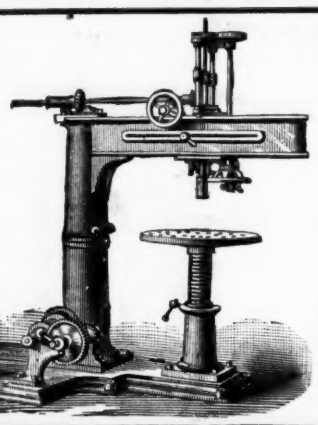

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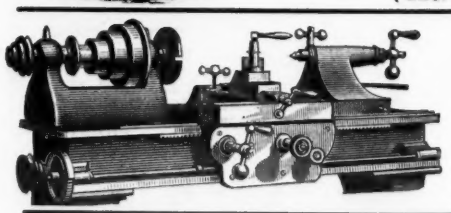

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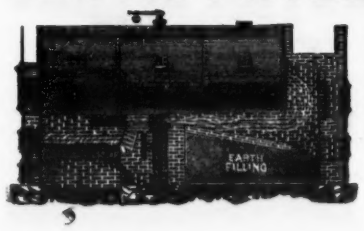

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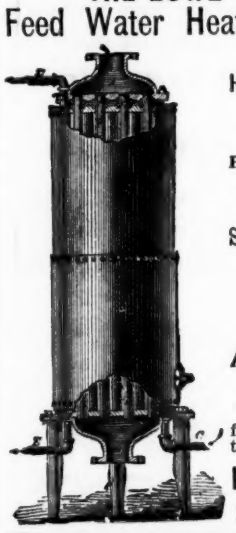

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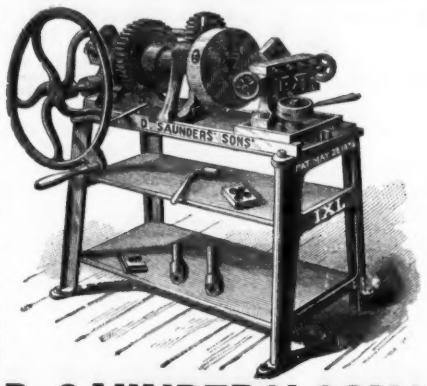

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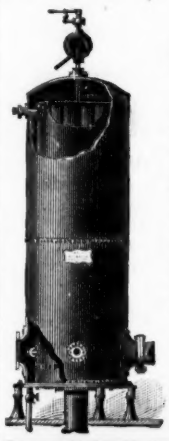

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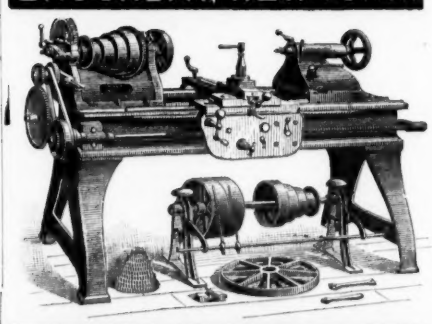

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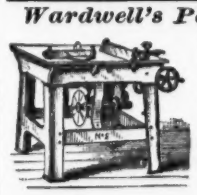

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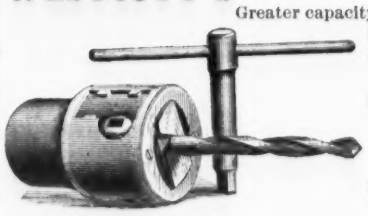

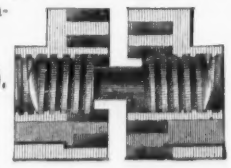

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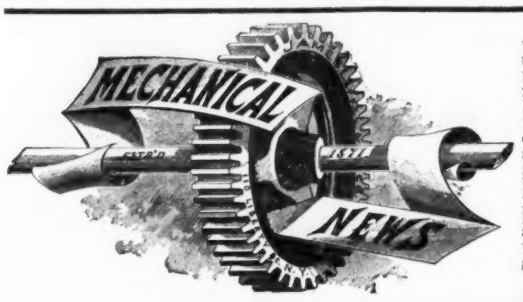

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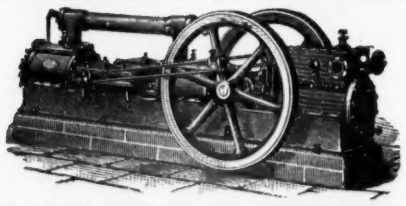
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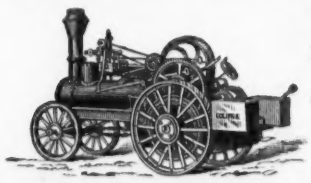
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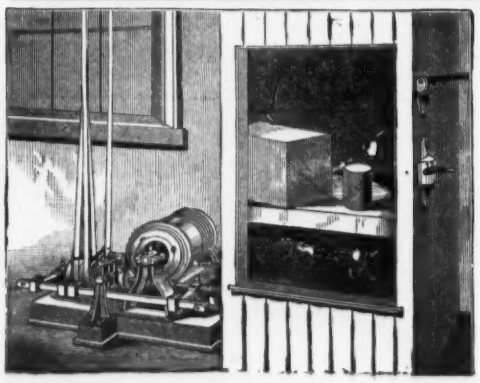
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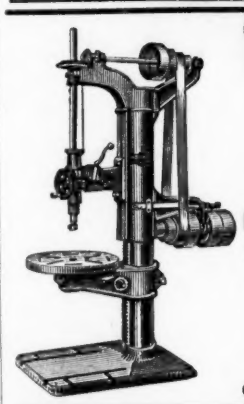
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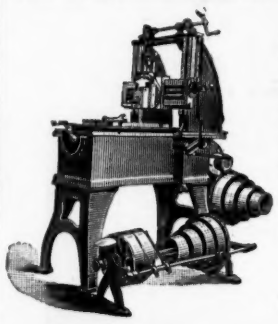
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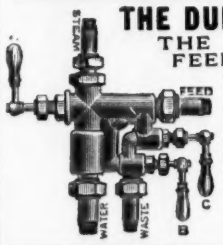

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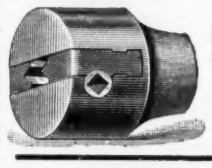
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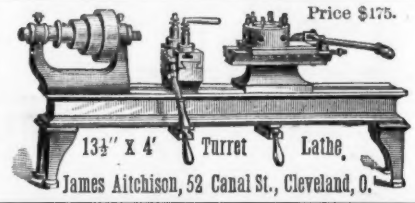
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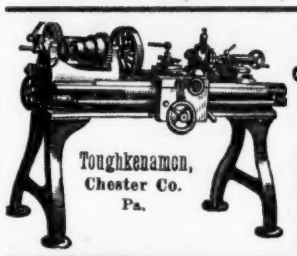
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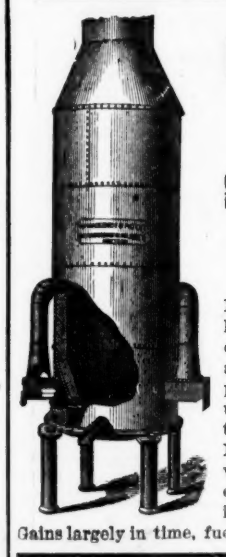
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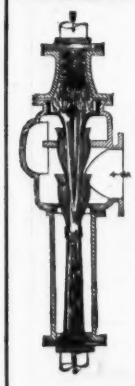
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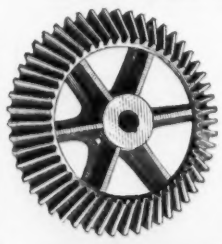
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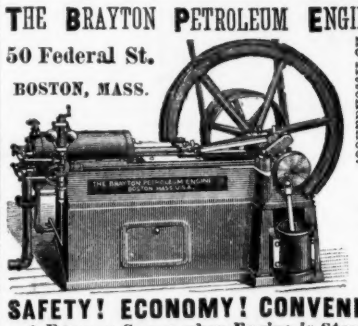
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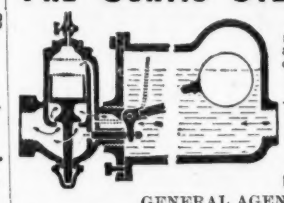
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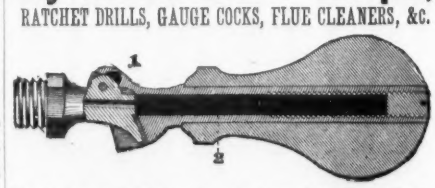

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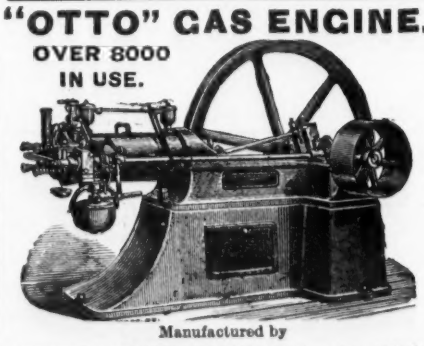
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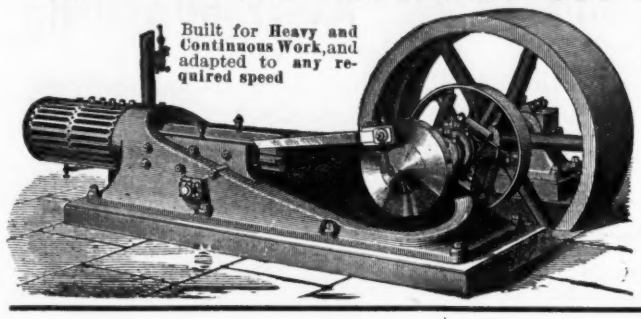

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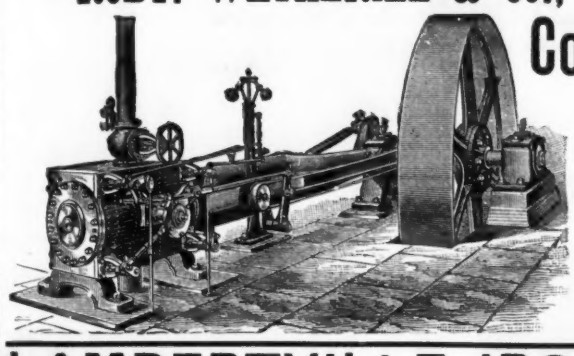

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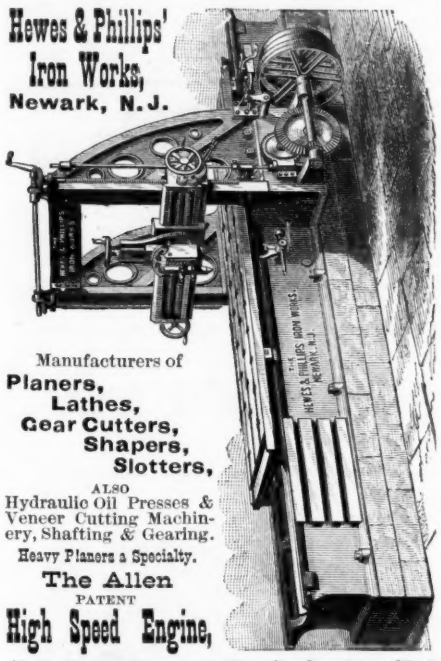

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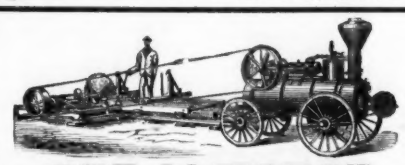

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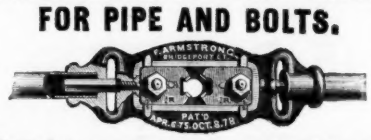

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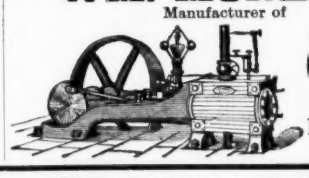

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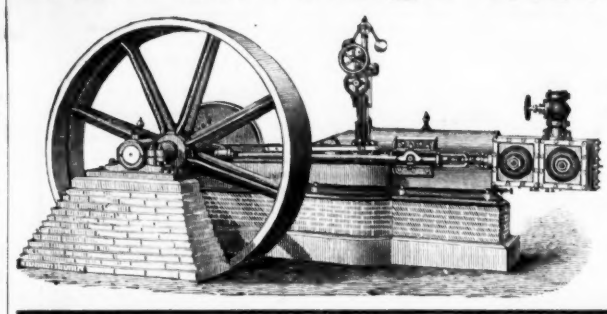

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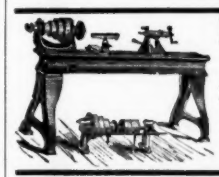

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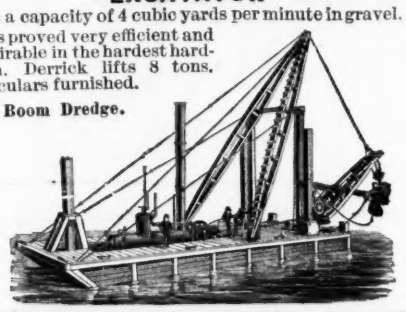

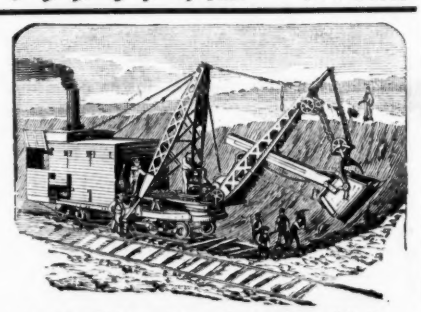

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22 in. x 22 in. Planers, 5 & 6 ft. Beds.

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WORCESTER, MASS.

New & Second-hand Machinery.

Jan. 3, 1883.

The following New and Improved Machinists Tools are part of what we have for early delivery

1 42 in. swing 20 ft. bed. Engine Lathe. Jan. 15.
1 36 in. " 18 ft. " " " " 15.
1 36 in. " 16 ft. " " " " 15.
1 New Corliss Engine, 16 in. x 42 in. Complete in four weeks. **The following on hand:**
1 New Corliss Engine. 12" x 36". Complete.
1 each, 26 in. swing, 10 & 12 ft. bed, New En. Lathe.
1 " 30 in. " 14,16 & 18 ft. bed. " " "
1 60 in. swing, 24 ft. bed, New Engine Lathe.
1 42 in. " 16 ft. " " " "
2 22 in. " 12 ft. " " " "
2 19 in " 10 ft. " " " "
4 18 in. " 8 ft. " " " "
5 15 in. " 6 ft. " " " "
1 10 in. " 5 ft. " " " "
1 30 in. " 12½ ft. " " " "
1 26 in. swing, 14 ft. bed. " " "
1 12 in. swing, 6 ft. Hand Lathe.
1 10 in. " 4½ ft. Bed Hand Lathe.
1 40 in. x 10 ft. Iron Planer.
1 38 in. x 12 ft. " "
1 32 in. x 8 ft. " "
1 26 in. x 6 ft. " "
2 30 in. x 8 ft. " Planers.
2 22 in. x 4 ft. " "
2 38 in. Swing Upright Drills. B. G. & S. F.
1 23 in. Drill. B. G. & S. F.
1 22 in. " Upright Drill. B. G. S. F.
1 23 in. & 3, 20 in. Drills. Plain.
1 18 in. Bench Drill.
1 each, 3 & 4 Spindle Drill.
1 Double Nut Tapper. Horizontal.
1 12 in. stroke Slotting Machine.
2 each, 12 & 15 in. Shapers.
2 12 in. stroke Shapers, traveling head, 40 in. traverse double tables.
2 4½ in. Hyde's Pat. Centering Machines.
1 6in. stroke Hand and Power Shaper.
3 Wood's Patent Bolt Cutting Machines to cut from ⅛ in. to 2 in. inclusive.

Second-Hand.

2 4 Spindle Drills, 1 Face Milling Machine.
1 Pond's Double Miller, 1 Screw Head Slotter.
1 No. 1 Brown & Sharpe Screw Machine.
1 Profiling Machine. 1 Bolt Pounting Machine.
1 Emery Grinder, for 10 in. Wheels.
2 Double-Acting Presses. 4 Single-Acting Presses.
90 Foot Presses. 1, 00 Fowler Press. 1 Foot Punch, with bench. 1 Railway Saw Bench.
2 Small Punching Presses, 1 Lot Pistol Machinery.
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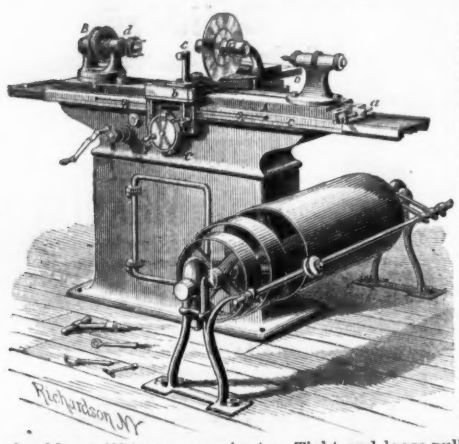
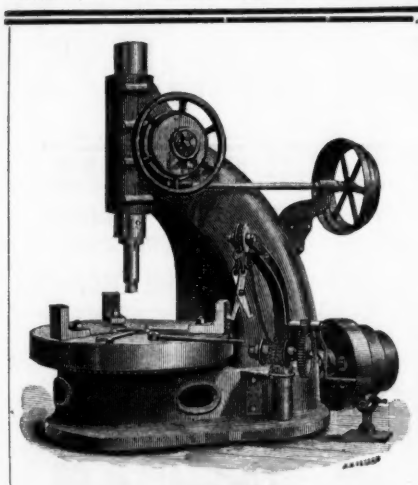
PATENT UNIVERSAL GRINDING MACHINE.



This Machine is arranged for doing a large variety of operations of grinding by the use of solid emery or corundum wheels. An additional movable table, capable of adjustment by a tangent screw and graduated arc, admits of straight and curved taper grinding with the centers of the machine always in line. It is specially adapted for grinding soft or hardened spindles, arbors, cutters, either straight or angular, reamers and standards, also for grinding out straight and taper holes, standard rings, hardened boxes, jewelers' rolls, &c. The work can be revolved upon dead centers or otherwise. The grinding wheel can be moved over the work at any angle, by which means any taper can be produced. Wheels from one quarter inch to 12 inches in diameter can be used either with or without water. The feed works and slides of the machine are covered and fully protected from grit and dust. The grinding of taper holes and angular cutters is provided for with graduated arcs. A special chuck for holding work to have holes ground, accompanies each machine. The spindle and boxes of the machine are of cast steel hardened and ground. Distance between centers, 28 inches; will swing 12 inches in diameter. The overhead works consist of a drum, tight and loose pulleys and adjustable hangers with self-oiling boxes. Countershaft should run 400 turns per minute. Tight and loose pulleys, 8 inches diameter, 4 inches face. Weight of machine, with overhead works, about 2200 lbs. Illustrated Catalogue sent per mail on application.



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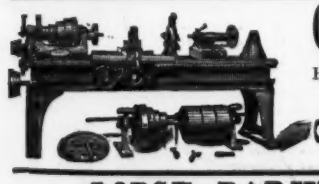

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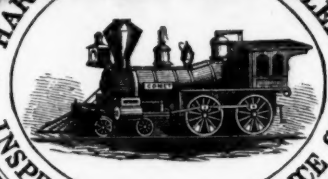

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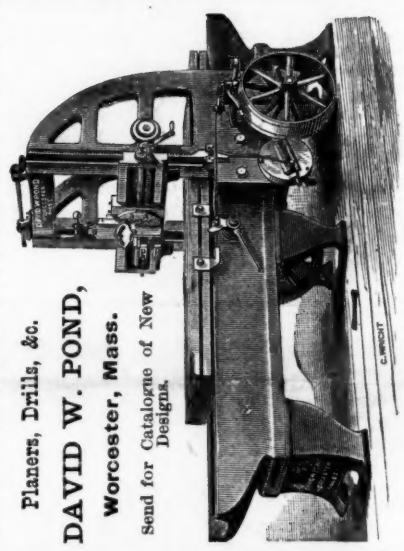

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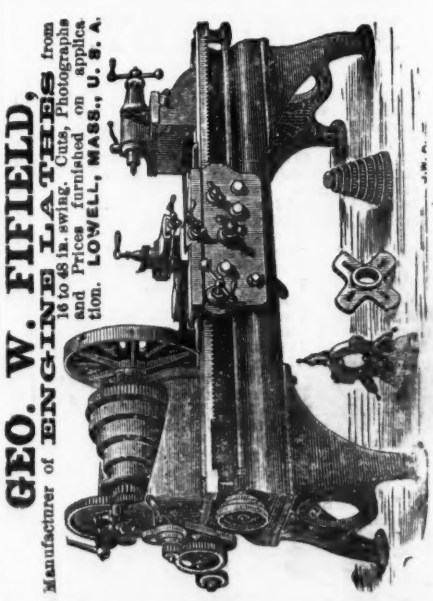

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